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The Use of Psychological Tests in the Educational and Vocational Guidance of High School Pupils

(REVISED AND ENLARGED EDITION)

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EDITOR'S INTRODUCTION

When Professor Terman's book on *The Intelligence of School Children* appeared, it became evident that Leland Stanford Junior University was the center of a surprisingly extensive investigation of human mentality. It was clear that records were being made, not once, but repeatedly, with reference to the same children and that many of these children were being kept under observation throughout their school careers and even beyond. In other words, the common curse of our educational inquiries, in virtue of which nothing is studied hard enough and long enough to reach fundamental results, seemed to have been lifted from the efforts of the Stanford group of men and women.

One of the members of the Stanford group is Dr. William M. Proctor, the author of this book. He has given particular attention to high-school pupils and to underclassmen in college and it is to these groups that he has applied his tests.

These tests are for the most part such as may be given to large numbers of persons simultaneously. Instruments of this kind have been appropriately called group tests, in contradistinction to the individual or interview tests in the use of which an examiner handles only one person at a time. The history of the development of these group tests to their present status has been sketched in a number of places. It is generally and correctly understood that the prototype of all the present group intelligence tests is the collection of examinations loosely termed the Army Tests.

From the Army Tests, either in direct descent or by collateral branches, has sprung a large progeny in the form of group intelligence scales or tests. The use of these tests has already become enormous. To a certain extent the persons who have devised them have become victims of this popularity. When the school people will buy and use these tests by the millions, there is a temptation for authors to rush them into print without sufficient preliminary analysis and without extensive trial in practical situations.

Of course, this is only a temporary condition. Out of the competition among different tests and the trials of two or more of them on the same individuals will come a critical literature which will surely bring untrustworthy instruments into disrepute. This sort of literature is only just now coming through. The development of group intelligence tests has been so rapid that books on their use have not had time to appear. Magazine articles involving the use of one or two of them have been published. Dr. Holley's monograph on the use of mental tests appeared during the past autumn. The present book is another of much the same sort. It deals with the Binet Scale, the Army Examinations *a* and *b,* and the Army Alpha Test.

But Dr. Proctor's book, although incidentally concerned with the validity of the different scales, is primarily devoted to the practical uses to which the results of intelligence testing may be put. For example, upon testing the same pupils after an interval of two and a half years, Dr. Proctor is especially interested in the fact that "the person who made the original tests . . . would have been in a position to give very helpful advice to all of the pupils tested by him; also that his predictions as to the possible educational future of each of these pupils would have deserved serious consideration by parents and teachers." Again, when it becomes possible to compare the success in high school of two groups of pupils of which one has received guidance on the basis in part of intelligence testing while the other has received no such guidance, Dr. Proctor is especially interested in this practical demonstration. About a third of the unguided pupils, but only one-fifth of the guided pupils, failed in one subject. None of the pupils who had received the benefit of guidance failed in two or more subjects, while rather more than one in ten of the unguided pupils failed to that extent.

In other directions his interest in the practical use of intelligence tests leads him into the field of vocational guidance. Here he makes good use of the work of the army psychologists by which the intelligence of recruits belonging to different occupations was revealed. These he relates to the occupational prefer-

ences which he obtained from over nine hundred high-school pupils. The lowest intelligence score made by the middle 50 percent of professional workers among the army recruits was 98. On the other hand, 50 of the high-school pupils who expressed their intention of becoming professional workers scored less than 90. Again, he points out the fact that over 60 percent of the high-school pupils aspired to join the ranks of the professional class while, according to the United States census, less than 5 percent of the gainful workers of the country belong to that class. Dr. Proctor, therefore, although not neglecting the theoretical and scientific aspects of his subject, gives particular attention to the practical bearings of it. Indeed, we should say that his monograph is a good example of a method of treatment, which, while it is competent from the point of view of research workers, is also of special interest to public school workers.

With respect to vocational guidance Dr. Proctor's material supports his view that those who seek a ready means of determining whether pupils should be telephone operators or photographers, bakers or blacksmiths, farm workers or barbers, are likely to be disappointed. Nothing in our general intelligence tests will enable us to be specific to this degree. If, however, occupations are divided into five or six general classes, the data at hand regarding the range of intelligence among people belonging to these classes are such as to permit us to say something definite concerning the class of work in which a given pupil may, so far as intelligence is concerned, be successful. Perhaps even here we can say with greater certainty what the class of occupations is in which the pupil will *not* be successful. For example, if a pupil's intelligence quotient is 90, we can be sure that his intelligence is not sufficient for professional work but that he may (if other conditions are favorable) successfully pursue some occupation belonging to the class of skilled labor. Whether that occupation shall be that of a bricklayer or a painter, a plumber or a carpenter, cannot be determined on the basis of intelligence. Such a determination will depend upon individual aptitude, pref-

erences, and opportunities. In other words, we may with some safety advise pupils as to classes of occupations, but we cannot assume—at least on the basis of general intelligence—to advise them with respect to particular occupations within the occupational classes.

Those, therefore, who are looking to the intelligence test to determine whether a boy should be a bookkeeper or a telegrapher may as well know at the outset that these tests offer no basis for such determinations. This comes about from the very simple fact that the same degree of general intelligence is required and is now being exhibited by both bookkeepers and telegraphers. In other words, the difference between the qualifications for workers of these two sorts is not intellectual in the general sense. Perhaps we shall subsequently develop trade and occupational tests which will differentiate more sharply than is now possible between the aptitudes pertaining to occupations in the same class. Indeed, we can already mark out in a general way the lines along which such investigation will proceed. There will be, in the first place—to stick to our bookkeeper and telegrapher—an analysis of the bookkeeper's job and the telegrapher's job for the purpose of finding out what these workers have to do. From these data some inferences may be made as to the specific abilities required in learning and performing the operations incident to the occupation. Having determined these abilities, or the most important of them, tests may perhaps be devised for measuring such abilities. Many trials of these tests and a checking of the results obtained from them against the ultimate success of persons who have become bookkeepers and telegraphers will be required in order to refine the tests to the point where they will be valid instruments. Meanwhile, one ought to point out that trade tests are quite different from guidance tests. For example, we have certain trade tests which have been developed in the army. We also have tests for clerks and stenographers. But all these tests are given to determine the ability of persons already belonging to the occupation or claiming to belong to it. A test to deter-

mine whether a person, prior to studying about an occupation or entering upon it, has the ability to pursue it successfully is quite another matter.

Dr. Proctor's chapter on the application of the Army Tests to freshmen upon entrance to college is especially interesting. It is worth noting how the different educational levels correspond to different intelligence levels. Dr. Proctor found, for example, that, expressed in terms of the intelligence quotient, the typical first-year high-school pupil has a mentality of 105. Three or four years later, when elimination throughout the high school has had its effect, the typical intelligence of high-school graduates has gone up 6 points—namely to 111. If the reader will recall Professor Terman's classification of intelligence quotients, he will observe that this means that more than half of the high-school graduates belong in the classification called "superior" or in a higher classification. Between graduation from high school and entering college another sharp elimination apparently takes place in virtue of which the mentality of typical students now moves up 4 points so that the median intelligence quotient for students entering college is 115. As Dr. Proctor points out, if the same process of selection takes place in college as in high school, "we should expect the median intelligence quotient of college graduates to be 120 or over." This means that students of no more than average intelligence will be likely to be eliminated from college before the senior year.

In conclusion, we should like to point out that Dr. Proctor makes no inordinate claims for the intelligence test. Some of the results—particularly the correspondences between intelligence scores and teachers' estimates and between intelligence scores and official ratings—would be higher if better tests had been at his disposal. The Army Alpha Test was not intended for high-school or college students. On this ground, and also because it was a pioneer and is capable of improvement, it is to be expected that future workers will secure even more significant correspondences than Dr. Proctor found. But whether this is true or not,

the spirit of the author would no doubt remain the same—the spirit of scientific conservatism which refuses (to use his own words) "to place undue confidence in the results of a single psychological examination, however thoroughly it may have been standardized."

B. R. BUCKINGHAM

January 22, 1921

CHAPTER I

INTRODUCTION

The secondary-school population of the United States has, since 1890, increased three times as fast as the general population. In the year 1915 there were 14.4 pupils of secondary grade for every 1,000 persons of the general population, whereas in 1890 there were only five. According to recent estimates there are in the United States 14,000 high schools caring for 1,500,000 pupils requiring the services of 80,000 teachers, and calling for the expenditure of $75,000,000 per year for salaries and maintenance.

The problem of administering the physical side of this vast educational enterprise has occupied the attention of school authorities to such an extent that small consideration has been given to the need for internal betterment. The average American community is willing to tax itself for material equipment. An imposing high-school building becomes a matter of civic pride. It is a good talking point in chamber of commerce literature, and can be shown to visitors as an index of the progressive nature of the community.

Many of our city high schools are housed in buildings superior to those occupied by the best colleges and universities a generation ago. Buildings costing from $500,000 to $1,000,000 are not uncommon; and it is perfectly safe to say that no other nation has begun to spend as much upon its secondary-school buildings as has our own.

When, however, it comes to securing more money for teachers' salaries, for enriching the curriculum, or for other matters of internal improvement, the task is much more difficult. The results obtained by spending money to make a better adjustment between the child and the curriculum, or between the child and his future place in the social order, are quite intangible. It is very difficult to prove to the tax-paying public that money so spent will pay ascertainable dividends.

Since the public is more willing to spend money on buildings that can be seen than on invisible internal betterments, reforms in our secondary schools have come very slowly. Natural conservatism as well as considerations of economy have combined to sustain the traditional curriculum in seventy-five out of every hundred high schools.

So long as preparation for college was the chief end and aim of secondary education, the narrow, college-preparatory course of study was satisfactory. But since the high-school population now comes from every class of home, and since only 10 percent of those who enter high school ever reach college, the demand has come to be more and more insistent that secondary education shall prepare the youth of the land for citizenship and vocations.

In the discussion of the proposed reorganization of secondary education large space is being given to the problem of educational and vocational guidance. The classical, college-preparatory high school of former days had no need of educational guidance. There was only one course of study. It was a case of take it or leave it. Neither was there great need for vocational guidance. Those who could master the prescribed course of study were headed for the professions. Those who were unable to complete the course taught school or went back to the farm. The boy or girl in perplexity as to a life career could find wise and sympathetic counselors in the village minister, doctor, or lawyer.

The boy or girl of the present day faces a much more complex situation. The fields of vocational opportunity have been greatly multiplied. Where formerly there were six or seven possible lines of life work open to the educated man or woman, there are now literally hundreds. Some agency must take over the task of collecting, organizing, and imparting accurate information regarding possible vocational opportunities to the boys and girls in our high schools.

The necessary information is no longer easily accessible to the inquiring boy or girl. The "No Admittance Except on Business" sign bars them from shop and office alike. They have become more and more dependent upon imparted, as against first-hand,

information concerning the qualifications necessary to success in the different fields of endeavor. The minister has been practically eliminated as a factor in vocational guidance, because the church reaches such a small fraction of the high-school population. A majority of parents have neither the disposition nor the means to acquire adequate information regarding vocations to make them competent counselors. This means that the home is a much less important factor than it used to be in the vocational guidance of youth.

The high school, therefore, becomes the residuary legatee of the church and the home in the field of educational and vocational guidance. Whether the high school meets its opportunity for service in this new direction or fails entirely to function will depend upon the methods of educational and vocational guidance adopted.

The vital nature of guidance in education is well stated by Truman Lee Kelley:[1]

> The modern idea of education is crystallizing into an effort to guide rather than to instruct—to answer a need rather than to cater to a curriculum. The growing recognition of the need of vocational and educational guidance is resulting in the establishment of bureaus endeavoring to give the former, and in the training of psychologists to solve the problems of the latter.

Also by J. M. Brewer:[2]

> The development of men and women is the purpose of the school, and the selection of and preparation for occupations is one of the important features of this development. The school must therefore be organized with the vocational guidance of the child as one of the aims in mind.

This monograph embodies the results of a recent study by the writer involving the use of psychological tests in the educational and vocational guidance of high-school pupils. The data gathered and the conclusions reached are presented in the hope that those interested in the advisement problem in the high school may find herein helpful suggestions or be stimulated to make constructive criticisms in the light of their own experience.

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[1] Kelley, Truman Lee. *Educational guidance.* (Teachers College, Columbia University Contributions to Education, No. 71.) New York: Teachers College, Columbia University, 1914, p. 1.

[2] Brewer, J. M. *The vocational-guidance movement.* New York: Macmillan Company, 1918, p. 58.

The study was begun in the school year 1916-1917. All the pupils of the September and February entering classes of the Palo Alto Union High School were given the Stanford Revision of the Binet Intelligence Scale. In 1917-1918 group tests, Army Examinations *a* and *b*, and Army Alpha Test, Form 5, were given to more than 1,600 high-school pupils, representing nine different institutions.

The high-school progress of these pupils has been noted; information as to vocational ambition, educational plans, etc., has been secured; teachers have been asked to give estimates of ability; and the school marks of those remaining in school have been obtained. The records made by 93 pupils who were graduated from high school subsequent to being given the psychological tests, and who entered Stanford University, have also been compiled. Chapter IV represents a sixth year follow-up of 132 Bineted cases, and sets forth the educational history of each case. Chapter VI represents a fourth year follow-up of over seven hundred cases to whom group intelligence tests were given. It throws light on the persistence of educational and vocational plans and their relation to intelligence.

The following chapters will indicate what the writer found to be the value of the tests as a means of predicting probable high-school, vocational, or university success. The word "probable" is used advisedly because it should be stated at the outset that the writer is not disposed to place undue confidence in the result of a single psychological examination, however thoroughly it may have been standardized.

The results obtained are at least suggestive of the methods of procedure, in the use of psychological tests by the high-school principal or teacher, that will throw the most light upon the problem of educational and vocational guidance in the high school.

CHAPTER II

PSYCHOLOGICAL TESTS AS A MEANS OF MEASURING THE PROBABLE SCHOOL SUCCESS OF HIGH-SCHOOL PUPILS

The validity of the Stanford-Binet Scale, when applied to high-school pupils, was discussed by the writer in the issues of *School and Society* appearing October 19 and 26, 1918.[1] In those articles it was shown that very significant correlations had been obtained between intelligence quotients,[2] (I.Q.'s), resulting from the individual tests of 107 high-school pupils and the school marks earned by the same pupils during the school year 1916-1917; also between I.Q.'s and teachers' estimates of intelligence made during the same year.

Two years and a half later there were 66 of the original 107 high-school pupils remaining. Teachers who had known all of these pupils during their stay in the high school were asked to give estimates of their intelligence upon the same rating sheet as that which was used in 1916-1917. All school marks earned during the two and one-half years were averaged. Correlations were then found (a) between the I.Q.'s obtained in 1916-1917 and the teachers' estimates made in 1919; (b) between the average of all school marks earned up to April 1, 1919, and I.Q.'s obtained in 1916-1917; and (c) between the average school marks and the teachers' estimates made in 1919. Table I shows the close agreement between the correlations obtained in 1916-1917 and those found in 1919.

Table I shows that the correlations obtained in 1918-1919, when the same comparisons were made as in 1916-1917, were

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[1] Proctor, W. M. "The use of intelligence tests in the educational guidance of high-school pupils," *School and Society*, 8:473-78, 502-9, October, 1918.

[2] The intelligence quotient is obtained by dividing the mental age by the chronological age. Thus a twelve-year-old chronologically who tested eight years old mentally would have an I.Q. of 0.66, expressed for convenience "66." The I.Q. is an index of relative brightness. For further discussion of intelligence quotient see: Terman, L. M. *The intelligence of school children.* New York: Houghton Mifflin Co., 1919, p. 7.

TABLE I. COMPARISON OF CORRELATIONS OBTAINED IN 1916-1917 WITH THOSE OBTAINED IN 1918-1919[a]

Year	Correlation between I. Q. and Teacher Estimates	Correlation between I. Q. and School Marks	Correlation between School Marks and Teacher Estimates	Total Number of Cases
1	*2*	*3*	*4*	*5*
1916–17.....	0.586±0.043	0.545±0.046	0.702±0.033	107
1918–19.....	0.583±0.055	0.487±0.063	0.667±0.046	66

[a] Pearson's formula[3] (shorter method) was used in making all correlations.

practically as high as those obtained in the first instance. The results of two and one-half years of follow-up work seem to indicate that the person who made the original tests with the Stanford-Binet Scale in 1916-1917 would have been in a position to give very helpful advice to all of the pupils tested by him; also that his predictions as to the possible educational future of each of these pupils would have deserved serious consideration by parents and teachers.

As a means of discovering individual differences between school children in order that they may be grouped in classes according to ability, the individual psychological test has been shown to be a helpful tool. From the standpoint of school administration, however, the individual test presents serious difficulties. The time required to give an individual test to a high-school pupil varies from 40 minutes to 120 minutes. The total number of pupils that can be examined by a single examiner in a day will seldom exceed ten. The use of the Stanford-Binet abbreviated scale enables an examiner to test from 15 to 25 pupils in a day. Even so, it is impossible to use the individual method when a rapid survey of an entire school population is to be undertaken.

Group mental examinations afford the only means of meeting the demand for a speedy and reliable method of measuring the

[3] Rugg, H. O. *Statistical methods applied to education.* New York: Houghton Mifflin & Co., 1917, p. 274.

mental abilities of large groups of people. Under the supervision of Dr. L. M. Terman the writer directed the giving of Examination *a* (Form A) and Examination Alpha (Form 5) of the Army Scale to 1,349 high-school pupils, representing eight California high schools, during the school year 1917-1918.

Examination *a* consists of ten tests: (1) Oral Directions, (2) Memory for Digits, (3) Disarranged Sentences, (4) Arithmetical Reasoning, (5) Information, (6) Synonym-Antonym, (7) Common Sense, (8) Number Series Completion, (9) Analogies, (10) Number Comparison. The total possible raw score is 237. This test was given to portions of the first-year high-school classes in the Oakland Technical, Oakland Central and Fremont (Oakland) high schools and to all of the pupils present on the day of the examination at the Palo Alto Union High School. The total number of pupils was 715.

Group Examination Alpha consists of eight tests: (1) Oral Directions, (2) Arithmetical Reasoning, (3) Practical Judgment, (4) Synonym-Antonym, (5) Disarranged Sentences, (6) Number Series Completion, (7) Analogies, (8) Information. This test was given to all pupils present on the day of examination in the San Mateo, Redwood City, Mountain View, and Santa Clara union high schools. The total number of these pupils was 624.

These group mental examinations were applied to all of the pupils in each of the high schools enumerated above at exactly the same time. A sufficient number of examiners, trained by Dr. Terman, was taken to each high school, to cover the entire high school in one forty-five minute period. The size of the groups ranged from 40 to 150. It took the writer and his assistant a total of 134 hours to test 107 high-school pupils by the individual method. Six trained examiners were able to give Examination *a* to 350 Palo Alto high-school pupils in 45 minutes. The test blanks were scored by university students. Their work was carefully checked and the results tabulated by the writer.

Group Test Results Compared with Individual Test Results

One hundred and sixteen of the high-school pupils tested with Examination *a* had previously been given the Stanford-Binet Scale. Table II makes comparison of the two kinds of mental examination. Although no Binet I.Q.'s are found in the group 140-149, six Army Scale I.Q.'s are between 140 and 149. This is because a higher mental age is attainable on the Army Scale than on the Binet Scale. For example, a high-school boy fifteen years and two months old passed every test in the Stanford-Binet

TABLE II. RELATION BETWEEN THE I. Q.'S OF 116 HIGH-SCHOOL PUPILS EARNED ON THE STANFORD-BINET SCALE AND THE I. Q.'S OF THE SAME PUPILS EARNED ON EXAMINATION *a*, ARMY SCALE

I. Q.'s on Stanford-Binet Scale	I. Q.'s on Examination *a*, Army Scale							Totals
	80–89	90–99	100–109	110–119 (*Median*)	120–129	130–139	140–149	
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
130–139	.....	.....	.....	.....	3	3	5	11
120–129	.....	.....	1	3	7	9	1	21
110–119 (*Median*)	.....	2	8	11	9	2	.....	32
100–109	.....	.....	13	3	4	.....	.....	20
90–99	.....	7	11	8	.....	.....	.....	26
80–89	.....	5	.....	.....	.....	.....	.....	5
70–79	1	.....	.....	.....	.....	.....	.....	1
Totals	1	14	33	25	23	14	6	116

Median for Binet I. Q.: group, 110-119
Median for Army Scale I. Q.: group, 110-119
Correlation, Pearson's formula, 0.736; P. E., 0.029

Scale, thus earning a mental age of nineteen years and six months, and an I.Q. of 129. On the Army Scale, Examination *a*, he made a raw score of 219, corresponding to a mental age score of

twenty-one years and eleven months, and an I.Q. of 144.[4] In other words, the Stanford-Binet Scale does not give the superior high-school pupil an opportunity to earn as high an I.Q. as he can earn on the Army Scale. This factor would tend to lower the correlation betwen the two sets of I.Q.'s. The correlation obtained in Table II (+ 0.736) is a strong indication that if the Stanford-Binet Scale is a valid means of finding the mental level of high-school pupils, the Army Scale Examination *a* is also valid for the same purpose.

Army Scale Results Compared with High-School Marks

The school work of all the high-school pupils examined by means of the two army group tests was carefully followed up for the school years 1917-1918 and 1918-1919. The marks given were reduced to a comparable basis by assigning arbitrary values to each type of mark employed by the various high schools. Thus an "A" or a "1" was given a value of 95; a "B" or a "2," a value of 85, etc. Letters or numbers with plus and minus signs were given intermediate values. All of the marks earned by a given pupil were averaged, but no case was included in the tables unless the marks for at least two semesters of school work, the equivalent of one year, were available.

1. *Army Scale, Group Examination* a.—Table III makes a comparison between the I.Q.'s obtained from the Group Examination *a* and the quality of high-school work of 494 high-school pupils. The total number taking the test was 715, but only 494 cases had ratings for one year of school work.

Since the correlation obtained (+ 0.343) is 12.8 times the indicated P. E., it has considerable significance. While it is not as high as the correlation between Binet I.Q.'s and school marks found in Table I, there are several factors which may have tended

[4] Mental age norms for both tests of the Army Scale were worked out by Dr. Samuel Kohs and the writer. It was found that about fifteen points of raw score on Examination *a* and Examination Alpha corresponded roughly to a mental age year. Possible raw score, Examination *a*, 237, possible mental age twenty-three years; possible raw score, Alpha 212, possible mental age 23 years and 2 months. See Appendix.

to lower the correlation. The army tests were designed for use with soldiers in cantonments. Many of the questions have to do with matters of common knowledge about a military camp, but with which high-school pupils have no acquaintance. This would especially affect the scores of high-school girls. There are twenty cases falling in I.Q. groups below 95, where the indicated school work is of a quality of 80 percent or above, and fifteen of these cases, or 75 percent, are girls.

Another factor which may have tended to lower the correlation is the skewness of the school marks curve toward the high percents. The median school marks group in Table III is 80-84.

TABLE III. CORRELATIONS BETWEEN THE I. Q.'S OF ARMY GROUP EXAMINATION *a* AND THE QUALITY OF SCHOOL WORK OF 494 HIGH-SCHOOL PUPILS

School Marks	Army Group Examination *a* I. Q.'s										Totals
	84 or Lower	85–89	90–94	95–99	100–104	105–109 (*Median*)	110–114	115–119	120–124	125 or Above	
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
90 or above	.....	....	3	2	2	3	6	6	6	6	34
85–89	.....	.....	5	9	18	24	22	24	8	4	114
80–84 (*Median*)	1	2	9	28	41	46	30	13	9	3	182
75–79	1	3	9	19	19	19	19	7	2	.....	98
70–74	2	3	4	14	11	11	7	1	1	.....	54
65–69	.....	1	1	4	1	1	2	1	.....	.....	11
55–64	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....
Totals	4	9	31	76	92	105	86	52	26	13	494

Medians: I. Q.'s, group, 105-109; school marks, group 80-84
Semi-interquartile ranges: I. Q.'s, 6 points; school marks, 4½ percent
Correlation, Pearson's formula, 0.343; P. E., 0.027

This represents a grade of "B" or "2." It is necessary for these high-school pupils to receive marks of "B" or "2" in all subjects required for university recommendation. The Palo Alto High

School is in close proximity to Stanford University, and the Oakland high schools are in the immediate vicinity of the University of California. The fact that 68.8 percent of the grades given to these 494 high-school pupils were "B" or above is an indication that teachers were influenced in their marking by the demand for "B" grades for university recommendation. Many pupils with just *average* ability were given marks *superior*. Hence there might be a rather wide difference between their mental ability as shown by the tests and their school progress as shown by their marks.

2. *Army Scale, Group Examination Alpha.*—Table IV compares the I.Q.'s of 480 of the high-school pupils of San Mateo, Redwood City, Mountain View, and Santa Clara with their school marks. There were 624 pupils belonging to these high schools who took Examination Alpha, but only 480 cases came under the rule requiring ratings for one whole year of school work.

TABLE IV. CORRELATIONS BETWEEN THE I. Q.'S OF THE ARMY GROUP EXAMINATION ALPHA AND THE QUALITY OF SCHOOL WORK OF 480 HIGH-SCHOOL PUPILS

School Marks	Army Group Examination Alpha I. Q's.										Totals
	84 or Lower	85–89	90–94	95–99	100–104	105–109 (*Median*)	110–114	115–119	120–124	125 or Above	
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
90 or over	.....	.....	.....	3	3	15	12	9	9	5	56
85–89	.....	.....	.....	8	17	15	24	13	6	6	89
80–84	.....	.....	4	6	22	21	20	10	5	1	89
75–79 (*Median*)	.....	.....	7	25	33	23	10	7	4	.....	109
70–74	.....	4	10	18	14	22	12	1	1	.....	82
65–69	1	3	3	12	7	8	8	1	.....	.....	43
55–64	.....	.....	2	5	3	1	1	.....	.....	.....	12
Totals	1	7	26	77	99	105	87	41	25	12	480

Medians: I. Q.'s, group 105-109; school marks, groups 75-79
Semi-interquartile ranges: I. Q.'s, 6 points; school marks, 6½ percent
Correlation, Pearson's formula, 0.413; P. E., 0.026

The correlation obtained in Table IV (+ 0.413) is 15.9 times the indicated P. E. and 0.07 higher than the correlation found in Table III. The higher correlation found in this table may be due to the fact that Examination Alpha was the result of careful revision of the first series of tests in the light of preliminary experimentation in three army cantonments and of the returns from the tests of several thousand school children. Also, the high schools in which Examination Alpha was applied were not in such close proximity to universities as were the high schools represented in Table III. The group median for school marks is 75-79, and only 48.8 percent of the ratings given in these four high schools ranged as high as "B" or over.

When account is taken of the possible reasons for the difference in the correlations as shown in Tables III and IV, it is safe to say that they are of approximately equal value. For use in the public schools Examination Alpha is the better scale, because it consists of but eight tests, can be given in less time, is scored more rapidly, and costs less to print.

TABLE V. DISTRIBUTION ON APRIL 1, 1919, OF 107 HIGH-SCHOOL PUPILS TESTED WITH STANFORD-BINET SCALE IN 1916–1917

Binet I. Q.'s Earned in 1916–1917	Total Number of Cases	Distribution April 1, 1919, by Percents		
		Out at Work (%)	Out, Transfer'd to Other High Schools (%)	Remaining in Same High School (%)
1	*2*	*3*	*4*	*5*
79 or lower	1	100	0	0
80–89	7	72	14	14
90–99	29	31	9	60
100–109	27	22	22	56
110–119	22	0	27	73
120–129	15	0	13	87
130 or above	6	0	33	67
No. of cases	107	21	20	66
Median I. Q.'s	.....	94	110	110

Individual and Group Mental Tests as Means of Indicating Probable Retention or Elimination of High-School Pupils

1. *Elimination among pupils tested with the Stanford-Binet Scale.*—On the first day of April, 1919, it was found that 41 of the original 107 pupils tested in 1916-1917 with the Stanford-Binet Scale had dropped out of school, leaving 66 still in attendance. Table V gives the distribution of the 107 cases, showing the I.Q.'s of pupils who left high school to go to work, of pupils who were transferred to other high schools, and of pupils who still remain in the same high school.

The only pupil testing below 80 I.Q dropped out at the end of the first semester of 1916-17 to go to work. All of those in group 80-89 who left school to go to work did so by the end of the first year. Failure in school work has been recognized as the most fruitful cause of elimination from high school, but the relation between mental ability and failure in school work has not heretofore been given due consideration. At the end of two and one-half years none of those testing below 80 and only 28 percent of those testing 80-89 remain in high school. On the other hand, 100 percent of those testing 110 or over are pursuing their studies either in the Palo Alto High School or in other high schools. When the average school ratings of the different groups are taken into account the close connection between mentality and elimination will be still more apparent. The average school rating of the 21 who left school to go to work was 73 percent; of the 20 transferred to other high schools, 77 percent; and of the 66 remaining in the Palo Alto High School, 79 percent.

2. *Elimination among pupils tested with the Army Examination a and Alpha.*—Only five of the eight high schools where the Army Scale was applied were selected for follow-up work in connection with elimination because the records of the three Oakland high schools did not indicate whether the pupil leaving had been transferred to another high school or had gone to work. In the case of the Palo Alto, San Mateo, Redwood City, Mountain

View, and Santa Clara high schools, it was comparatively easy to secure reliable data with reference to every pupil who took the test. The principals of all these schools had served in their respective positions from four to fourteen years, knew their pupils thoroughly, and had on record information concerning the movements of those who had left school since the giving of the Army Tests in 1917-1918.

Table VI gives for those tested with the Army Scale a distribution similar to that contained in Table V for the 107 tested with the Stanford-Binet Scale. The 955 pupils of the five high schools above mentioned have been distributed by I.Q.'s into four groups: (1) those who left high school to go to work; (2) those who transferred to some other high school; (3) those who graduated; (4) those remaining in high school on April 1, 1919. The follow-up work covered one and one-half years of school work. Figure 1 illustrates graphically the data of Table VI.

TABLE VI. DISTRIBUTION OF 955 HIGH-SCHOOL PUPILS ON APRIL 1, 1919, WHO WERE TESTED WITH ARMY TESTS IN 1917-1918 BY I. Q. GROUPS

Army Scale I. Q.'s Earned 1917–1918	Total Number of Cases	Distribution on April 1, 1919, by Percents			
		Out at Work (%)	Out, Transferred to Other High School (%)	Out by Graduation (%)	Remaining in Same High School (%)
1	*2*	*3*	*4*	*5*	*6*
79 or lower....	13	61.5	7.7	0.0	30.8
80–89.....	73	34.3	8.2	5.5	52.0
90–99.....	202	26.2	8.9	11.4	53.5
100–109.....	283	12.3	8.8	14.1	64.8
110–119.....	221	4.0	14.5	23.0	58.5
120–129.....	101	6.9	11.8	19.8	61.4
130 or over....	62	1.6	9.8	24.6	64.0
No. of Cases..	955	138	100	153	546
Median I. Q.'s.	.....	96	110	111	107
Percent I. Q.'s below 100...	.....	62.4	25.0	17.6	26.5

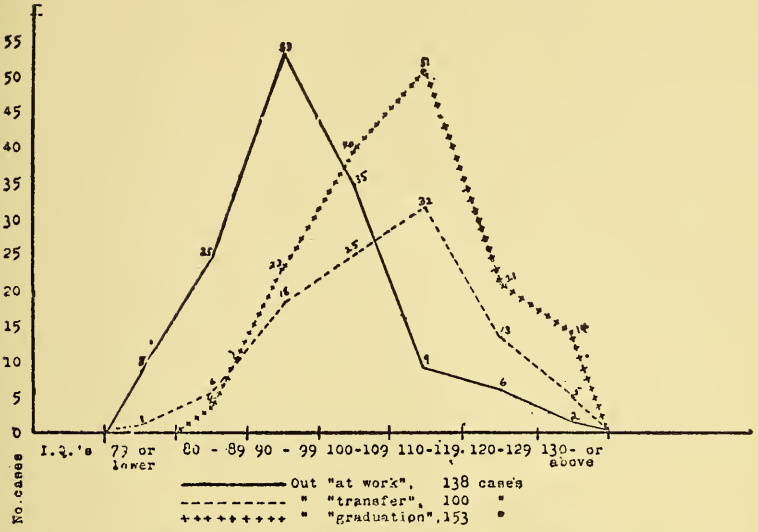


FIGURE 1. ILLUSTRATING TABLE VI

In this table there appears to be a strong confirmation of the findings of Table V, as the following comparison will show:

TABLE VIA. MEDIAN I. Q.'S BY GROUPS

	Out at Work	Out, Transferred to Other High School	Remaining in Same High School
1	2	3	4
Table V.....	94	110	110
Table VI.....	96	110	107

TABLE VIB. PERCENT OF PUPILS IN EACH GROUP WHOSE I Q.'S WERE BELOW 100

	Out at Work	Out, Transferred to other High Schools	Remaining in Same High School
1	2	3	4
Table V.....	71.4	20.0	27.0
Table VI.....	62.4	25.0	26.5

The agreement between the two tables is the more striking when it is remembered that the 107 high-school pupils of Table V were all first-year pupils when the tests were given, while the 955 pupils of Table VI comprise all the classes of five different schools.

The tendency, noted in the discussion of Table II, for girls to make lower scores on the Army Scale than boys accounts for the 5.5 percent of pupils with I.Q.'s of 80-89 who appear in the "out by graduation" group. These four pupils were all girls, and their average rating in school work was 83 percent.

Table VII indicates how school marks tend to correspond to mental level as indicated by I.Q.'s earned in the Army Tests.

Considering the "at work" cases, it appears that only the three highest I.Q. groups were doing a passing grade of work. Lack

TABLE VII. AVERAGE SCHOOL MARKS OF 955 HIGH-SCHOOL PUPILS, DISTRIBUTED ACCORDING TO THE CAUSES OF LEAVING

Cause of Leaving	79 I. Q. or Lower	80–89 I. Q.	90–99 I. Q.	100–109 I. Q.	110–119 I. Q.	120–129 I. Q.	130 I. Q. or Higher	General Average
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
At work.....	65	64	72	66	70	75	87	71.3
Transferred.....	59	67	76	72	82	85	86	75.3
Graduated	.....	83	79	84	85	84	92	84.5
Average marks by I. Q. groups.....	62.0	71.3	75.6	74.0	79.0	81.3	88.3	77.3

of mental ability was perhaps the most potent cause of elimination, but it was not the only cause operating in these cases. When interest in the subjects offered, application, and ambition are lacking, high scores in the mental tests are not necessarily a guarantee of school success. Turning now to the pupils transferred to other high schools, it appears that they made better average marks under every I.Q. group, except the very lowest, than did the "at work" pupils; but it is evident that some of them transferred to other high schools because of failure in school work. Later

checking up will no doubt find them out of school entirely. All of the cases in the "out by graduation" group show high average school marks, even those whose I.Q. is between 80 and 89. These are the same four cases discussed in connection with Table VI. They illustrate how necessary it is for those employing mental tests to be conservative in accepting the results of any single test as final.

When the school marks earned by all of these "out" groups are averaged a series of marks is obtained, ascending gradually from the lowest to the highest I.Q. ratings, which indicates a definite tendency for the quality of school work to correspond to the mental level indicated by the Army Tests.

A further following-up of the 153 who graduated from the five high schools between September, 1917, and April, 1919, brought out the fact that 94 of them were continuing their education in college, university, or normal school. The median I.Q. of those going on to higher educational institutions was found to be 116. One high-school girl, who earned an I.Q. of 140 on the Army Scale, graduated from the San Mateo High School at the age of fourteen years and five months. Because of the minimum age limit of fifteen years for entrance to the university, she was compelled to wait seven months before continuing her education. Had her case been included in the "at college" group, the median I.Q. would have been 118.

Taking into account all of the cases of high-school pupils tested either by the individual or group method of mental examination we find the following ascending scale of median I.Q.'s as a further indication that the psychological tests disclosed the *approximate* mental level of the cases discussed in the foregoing tables: first-year high-school pupils, median I.Q. 105; high-school graduates, 111; those going on to college, 116.

Summary

1. Individual and group mental tests of the types described have been shown to be sufficiently reliable to justify their use as aids in determining the mental level of high-school pupils.

2. Group tests, such as Army Scale Examinations *a* and Alpha, make possible a preliminary mental survey of an entire high-school population at the beginning of a school year. The resulting raw scores will be found to be of great value in grouping the pupils according to ability. Such tests should always be supplemented with every other possible means of discovering the mental level. The results should be considered tentative and subject to revision in the light of later developments.

3. The high-school principal who makes such a preliminary mental survey of his pupils can be reasonably sure that 50 percent of those who test below normal will be eliminated within the first two years; that 25 percent additional of the subnormal group will have been transferred to other high schools because of failure in their school work; and that a negligible number will ever graduate. With this information at hand he can plan the curriculums of his pupils more intelligently. Discovering at the outset that from 15 to 30 percent of his pupils are incapable of succeeding in the conventional high-school subjects, he will undertake to make new adjustments to meet the situation. There will be fewer failures; more pupils will remain to take work that is adapted to their needs and capacities; and the high school will be less open to the charge of catering only to the intellectual aristocracy among its pupils.

CHAPTER III

THE USE OF PSYCHOLOGICAL TESTS IN THE EDUCATIONAL GUIDANCE OF HIGH-SCHOOL PUPILS

In the previous chapter the writer has shown that there is a very close relationship between intelligence level and the elimination of pupils from high school. There are good grounds for the prediction that 75 percent of those who test below average, mentally, will fail in more than one-half of their studies during their first year of high school; that 50 percent of them will leave school to go to work during the first two years; and that none of them will remain to graduate. The members of this group demand special attention. If they are not carefully guided in the selection of their high-school work many of them will fail in all of their subjects during the first semester, with elimination as the inevitable result.

Heretofore we have acted upon the assumption that the only way to discover the capabilities of high-school pupils was to permit them to try themselves out in various subjects of the high-school curriculum. It has even been a common practice to require all first-year high-school pupils to take an abstract subject such as algebra. Thus many a promising educational bark has gone down on the uncharted rocks of the first-year high-school subjects.

Experimentation with psychological tests has now reached a stage where we can begin to hope that this wasteful trial and error method of procedure is to be discarded for a more scientific plan of educational guidance. No tests have yet been devised, either mental or pedagogical, which enable the adviser to chart unerringly the educational possibilities of a given youth, but we have made sufficient progress in mental measurements to be able to estimate with approximate accuracy the probable school success of a given pupil. The results of a practical experiment in educational guidance by means of mental tests will be described in the following pages.

Conditions Surrounding the Experiment

The mid-year VIII-A class of the Palo Alto intermediate school comprising 31 pupils was examined with the Stanford-Binet Scale in January, 1918. Figure 2 shows the distribution of in-

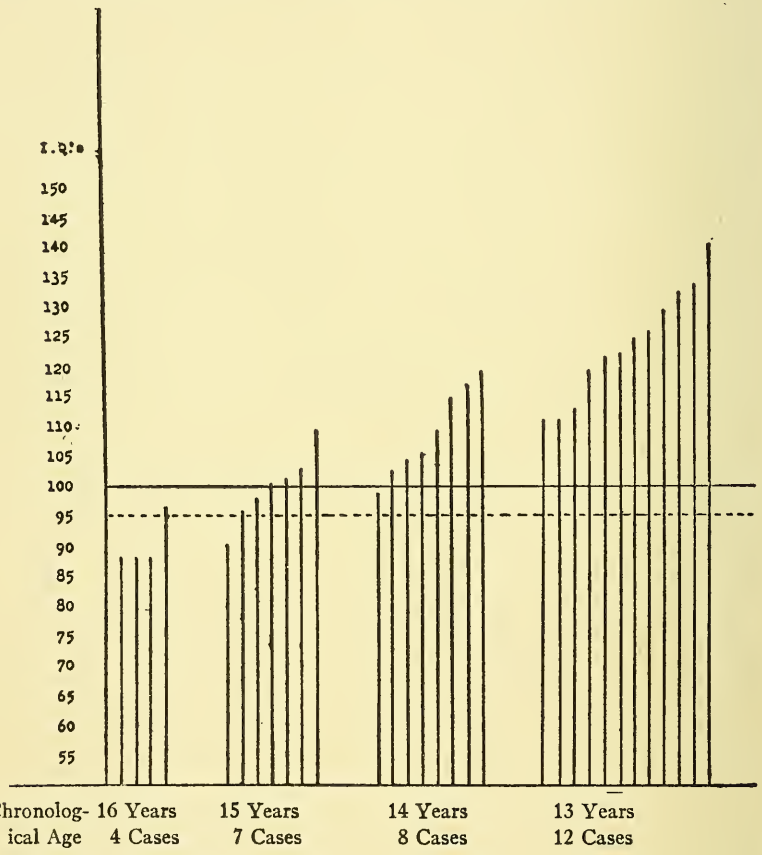


FIGURE 2. ILLUSTRATING DISTRIBUTION OF VIII-A[1] PUPILS BY I.Q.'S AND CHRONOLOGICAL AGES

telligence quotients by chronological age groups. There were twelve thirteen-year-old pupils, eight fourteen-year-old, seven fifteen-year-old, and four sixteen-year-old pupils examined. The

[1] In grade designations "A" means "second half."

lowest I.Q. discovered in the thirteen-year-old group was 110. All of the thirteen-year-olds were, therefore, accelerated mentally. None of the fourteen-year-old group fell below 95 I.Q. They were all at or above age mentally. One fifteen-year-old had an I.Q. of 90 and would be listed as "below average" in intelligence. Of the four sixteen-year-old pupils, all of whom would be accounted chronologically retarded, three had I.Q.'s of 88, and one an I.Q. of 96. That is to say, one of the sixteen-year-olds was normal and three would rate as "dull-normal."

Of the 31 members of the VIII-A class, 22 entered the Palo Alto High School in February, 1918. Four members of the class entered secondary schools elsewhere, two entered business colleges, two went to work, and one, a girl with an I.Q. of 88, eloped with a soldier from a nearby encampment.

Only four members of this VIII-A class had earned I.Q.'s below 95. One of these, as just indicated, did not enter high school. The remaining three entered high school, but two of them dropped out before the end of the first year. The percent of elimination from the class of those who tested below 95 I.Q. was therefore 75.0. The one who remains in high school is making an average record in scholarship. She made a rating of "average" on an Army Test given a few weeks later, and has shown herself capable of diligent application to her school work.

Each member of the class was questioned as to his or her vocational ambition, educational plans, and the subjects which he or she would like to take up during the first year of high school. These data, as well as results attained in Stanford-Binet and Army Mental Tests, were recorded on cards.

Use Made of Information Gathered

The cooperation of the vice-principal and the adviser of the entering class was obtained in order that the members of the VIII-A class might receive intelligent educational guidance when they entered the high school. Duplicate sets of cards were prepared for the use of these persons. On registration day all the newly

entered VIII-A graduates were referred to the vice-principal or the class adviser for help in making out their curriculums. No one was permitted to file a study card without this conference.

Following are samples of the cards used in this experiment in educational guidance. The only change from the original is in the case of the name.

CARD NO. 1

Smith, Jane

Chronological age: 13 yrs., 9 mo.

Score Army Scale...151

Stanford-Binet mental age: 16 yrs., 3 mo.

Army Scale mental age: 17 yrs.,5 mo.

Army Scale I. Q.....124

Stanford-Binet I. Q.....118

High school subjects which pupil desires to take:

Sewing
French
History
Typewriting
Piano

Educational plans: To finish high school and take business college course.

Vocational ambition: To be a stenographer or bookkeeper.

Grade of work done in intermediate and grammar schools: "B" and "B+"

Comment of Examiner: If assigned to algebra can safely be placed in first "rapid progress" division.

Jane Smith was advised to take subjects that would make it possible for her to go on to college as well as to carry out her ambition to become a stenographer. She took up English, German, algebra, and typewriting. During the first semester of her high-school course she made an average of "B" in all of her subjects.

Card No. 2 relates to Mary Jones who took exactly the subjects outlined on her card, except that being a first-year pupil she

was permitted to take four subjects only and had to wait until her second year for drawing. At the end of the first semester in high school she had earned three "A" grades and a "B+," with an average of 93 percent.

CARD NO. 2

Jones, Mary	Chronological age: 13 yrs., 1 mo.
Score Army Scale...148	Stanford-Binet mental age: 17 yrs., 2 mo.
Army Scale, mental age: 17 yrs., 2 mo.	
Army Scale I. Q....131	Stanford-Binet I. Q.....131
High school subjects which pupil desires to take: English Algebra Latin History Drawing	Educational plans: To finish high school and attend a university or normal school. Vocational ambition: To become a drawing teacher.

Grade of work done in grammar and intermediate schools: "A"

Comment of Examiner: Knows just where she is going and how to get there. May safely be permitted to select her own course of study. Assign to first division in algebra.

Here was the case of a girl with very superior ability as indicated by two different mental examinations, by her school record and by the estimates of her elementary and intermediate school teachers. She gave evidence of being an independent thinker, of knowing just what she wanted to make of herself, and just what she would have to do by way of preparation. The necessity for educational and vocational guidance in her case

might well be questioned. However, it was a real advantage to her teachers to know at the very beginning of her high-school

CARD NO. 3

Roe, Richard	Chronological age: 14 yrs., 4 mos.
Score Army Scale...150	Stanford-Binet mental age: 16 yrs. 9 mo.
Army Scale mental age: 17 yrs., 4 mo.	
Army Scale I. Q....120	Stanford-Binet I. Q.....117
High school subjects which pupil desires to take: English History Algebra French	Educational plans: To finish high school then attend a university or the U. S. naval academy. Vocational ambition: Chemical engineer or naval officer.

Grade of work done in elementary and intermediate schools: Very poor. Estimated as "average" by some grade teachers, and as "below average" by others.

Comment of Examiner: Boy has ability but needs to be waked up. Suggest that he take general science in place of history for first year. Also suggest that he be placed in first division in algebra where he will have to work. He will need to develop ability in both science and mathematics if he is to follow his vocational ambition.

career the quality of her ability and something of her life plans in order that they might give immediate and sympathetic co-

operation. Without this knowledge they might have made the mistake of holding her back to the pace of the "average" pupil. Fortified by the facts relative to her mental gifts and vocational ambitions, she is to be permitted to complete her high-school course in three years.

CARD NO. 4

Brown, Carrie — Chronological age: 15 yrs., 7 mo.

Score Army Scale... 100

Army Scale mental age: 14 yrs., 0 mo.,

Army Scale I. Q.....89

Stanford-Binet mental age: 14 yrs., 2 mo.

Stanford-Binet I. Q.....90

High school subjects which pupil desires to take:

English
Algebra
Latin
Typing
Drawing

Educational plans: To go to Mills College

Vocational ambition: To be a Chemist.

Grade of work done in intermediate and grammar schools: Grades in 8A class only fair, even in work that is being repeated. Estimates of elementary and intermediate teachers: "slow" but a conscientious worker.

Comment of Examiner: Should be discouraged as to taking Latin. Algebra doubtful, but if she insists in view of desire to go to college, assign to second division.

There is just as much danger that the bright pupil will not be given enough to do, as that the dull pupil will be given tasks that are too difficult to perform.

The boy whose card is set forth above enrolled for English, algebra, history, and general science, upon entering high school. During his first half year he made grades of "C" in English, and

"B" in each of his other subjects. This was a great improvement over the grades earned by him in the eighth grade. A recent checking up shows that he has brought up his English grade and is maintaining college recommendation standing in all his work. The mental tests were an aid to his advisers in discovering how to spur him on to creditable achievement in his school work.

The program finally worked out by Carrie Brown and the class adviser included English, algebra, free-hand drawing, and typing. Her grades at the end of the first semester in high school were: English, "C"; algebra, "E" (failure); free-hand drawing, "C"; typing, "B." She had failed in algebra, the subject counted as doubtful by the examiner, and had earned less than college recommendation grades in the only other subjects that would be counted toward entrance to Mills College. Even if she completes high school her chance of continuing in college is not at all bright.

A sufficient number of sample cards has been described to illustrate the method employed. There was no coercion. Counsel and advice in the selection of subjects were all that was attempted, but the counsel and advice offered were based on all the significant information with regard to mental ability, school success, vocational ambition, and teachers' estimates of ability that could be obtained. Certain pupils elected to take subjects which the advisers felt sure they would fail in and made passing grades. Others taking subjects on the advice of the counselors failed. Such cases simply illustrate the truth that no human agency, however fortified with information or however careful to mix common sense with theories, can hope to be infallible. The general results of the experiment, however, were very satisfactory.

Results Attained by "Guided" and "Unguided" High-School Pupils

The original group of 107 high-school pupils which entered the Palo Alto High School in September, 1916, were examined with the Stanford-Binet Scale after entering high school. They

had already selected their courses of study at the time of being examined. They may therefore properly be designated as the "unguided" group. A comparison of the first year's work done by the members of the "unguided" group with the work done by the group of 22 that entered high school in February, 1918, and which had the benefit of counsel based on mental tests and other significant data, will illustrate the value of careful guidance as against the trial and error method of selecting high-school courses of study.

TABLE VIII. COMPARATIVE FACTS REGARDING "GUIDED" AND "UNGUIDED" GROUPS OF HIGH-SCHOOL PUPILS

Group	Out at Work	Per-cent	Out by Transfer	Per-cent	Failed 1 Subject	Per-cent	Failed 2 or More	Per-cent
Guided....	1	4.5	2	9.1	4	18.2	0	0.0
Unguided..	13	12.1	14	13.1	33	30.8	11	10.3

It is not exactly true to fact to designate the original group of 107 as the "unguided" group. Most of them had been examined with the Stanford-Binet before the end of the first six-week period. Whenever the results of the first six weeks of school work confirmed the indications of the mental tests that a pupil would probably fail in such abstract subjects as algebra, Latin, etc., that pupil was permitted to drop the subject and continue the semester carrying but three subjects. The subject dropped at the end of the first six-week period was not counted as a failure in compiling the data for Table VIII. The mental tests were utilized to aid in correcting the mistakes made by the pupils in the unguided selection of their subjects. To this extent, then, the original group was guided, but the guidance came after, not before school work was begun.

The number of failures registered against the "unguided" group at the end of their first year in high school would undoubtedly have been greatly increased if it had not been for the limited guidance above described. This fact gives greater significance to the data presented in Table VIII.

The median I.Q. of the unguided group was 105, and the median I.Q. of the guided group was 108, a difference of three points in favor of the guided group, but this is not in itself an adequate explanation of the superior record made by the guided group during its first year in high school.

The most significant facts to be found in Table VIII are those relating to number of failures in one subject, and in two or more subjects. It appears that 30.8 percent of the unguided group failed in one subject, and 10.3 percent failed in two or more subjects during their first year in high school, while of the guided group only 18.2 percent failed in one subject and none of them failed in two subjects. Since it has been shown that failures in school work tend to increase the percent of elimination it is reasonable to attribute the small percent of elimination due to leaving high school to go to work, in the case of the guided group, to entire absence of failures in two or more subjects.

The results of the above described experiment in educational guidance by means of mental tests would seem to justify the conclusion that such tests may be of material assistance to the high-school administrator, if used in connection with other significant data. It is certain that the methods applied in this instance, if employed in any high school, would prove greatly superior to the wasteful "trial and error" methods that now prevail.

TABLE IX. CORRELATIONS BETWEEN I.Q.'S AND GRADES IN ALGEBRA OF 113 HIGH-SCHOOL PUPILS

Algebra Grades	I. Q.'s (Stanford-Binet)										Totals
	80–84	85–89	90–94	95–99	100–104	105–109	110–114	115–119	120–124	125–over	
"A"	.....	.....	.....	2	1	3	0	1	1	3	11
"B+"	.....	.....	.....	.....	.....	.....	1	2	2	5	10
"B"	.....	2	2	3	7	3	7	5	5	2	36
"C"	.....	1	4	5	6	2	5	3	3	3	32
"C−"	.....	.....	.....	1	.....	1	.....	.....	.....	1	3
"D"	.....	1	.....	2	1	1	1	.....	.....	.....	6
"E"	1	3	5	3	.....	1	2	.....	.....	.....	15
Totals	1	7	11	16	15	11	16	11	11	14	113

Correlation (Pearson): 0.46
Probable error: 0.05

Relation of General Level of Intelligence to Success in a Given Subject

In Table IX is shown the correlation between general levels of intelligence and high-school grades in algebra. The algebra grades are recorded under the letters A, B+, B, C, C—, D, and E. The I.Q.'s come under the groups 85-89, 90-94, 95-99, etc.

The correlation obtained, 0.46, which is nine times the probable error, can be counted as having considerable significance. An examination of the data contained in Table IX will show that twelve of the fifteen failures in algebra, or 80.0 percent of the total number of failures, were earned by pupils with I.Q.'s below 100. There were 35 pupils having I.Q.'s below 100, and 26 of them, or 74.3 percent earned marks below "B," which is the college recommendation grade in California. On the other hand there were 78 pupils with I.Q.'s above 100, and 45 of these, or 63.0 percent, earned marks of "B" or above. An I.Q. of 120 or over denotes very superior intelligence. There are 25 cases with I.Q.'s 120 or over in Table IX. All of these succeeded in earning passing grades in algebra. Only one received a mark as low as "C—."

High-school statistics show that algebra is responsible for more failures of first-year pupils than any other subject. Table IX suggests that probable success or failure in algebra can be inferred from the general level of intelligence as disclosed by mental tests. It follows that the high percent of failure in algebra could be materially reduced if only those were encouraged to take the subject whose general level of intelligence measured up to average or better.

Relation of Score in a Particular Mental Test to Success in a Given High-School Subject

Test No. 9, in Army Scale, Group Examinations *a* and *b*, is a "word relations" test. It involves a knowledge of word meanings and also the ability to use words intelligently in their proper relations to one another. Table X compares the scores made by 171 first-year pupils of the Palo Alto High School in Test No. 9

with the grades made by the same pupils in English during their first high-school year.

The directions for giving the test are as follows:

In each of the lines below, the first two words have a certain relation. Notice that relation and draw a line under the one word in the parenthesis which has that particular relation to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

TABLE X. CORRELATIONS BETWEEN GRADES IN ENGLISH AND SCORES IN GROUP INTELLIGENCE TEST NO. 9 OF ARMY SCALE OF 171 HIGH-SCHOOL PUPILS

Marks in First Year English	Scores in Test No. 9, Examinations *a* and *b*									
	1–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40	Totals
"A"	....	....	....	1	4	1	3	2	....	11
"B+"	....	....	1	1	7	14	10	2	....	35
"B"	....	....	1	5	16	19	13	6	....	60
"C"	....	3	9	17	17	8	6	2	....	62
"D"	....	....	....	....	1	1	....	....	....	2
"E"	....	....	....	....	1	....	....	....	....	1
Totals	....	3	11	24	46	43	32	12	....	171

Correlation (Pearson): 0.48
Probable error: 0.04

Sample sets are then given by the examiner to illustrate what is wanted:

sky—blue: grass—(grow, green, cut, dead)
fish—swims: man—(boy, woman, walks, girl)
day—night: white—(red, black, clear, pure)

There were forty sets of words and the time allowed was three minutes. For purposes of tabulation the scores made by the pupils are grouped: 1—4, 5—9,...35—39, 40—. The English grades are indicated by the letters A, B+, B, C, C—, D and E.

The correlation, 0.478, is twelve times the probable error and indicates that a good score in the "word relations" test is a fairly good index of ability in first-year high-school English. The marks in English were the final year marks, which represent the minimum of "D's" and "E's," because all conditions and failures had been removed that could be made up. The median score in

Test No. 9 was 26, and hence scores of 30 or over could be considered superior. There were 44 pupils who made scores of 30 or over, and 36 of these or 82.0 percent made marks in first-year English of "B" or above. Of the 89 who made scores of from 20 to 29 inclusive, 68.5 percent made marks in first-year English of "B" or above; while of the 38 who made scores of from one to nineteen inclusive, only 23.7 percent made marks of "B" or above.

Stated in terms of recommendation for college the above analysis of the data of Table X means that 76.3 percent of the high-school pupils whose ability in word relations is represented by a score of less than 20 fail to secure a college recommendation grade, while only 18.0 percent of those who attain a score of 30 or over in the same test fail to secure such a grade.

These results seem to indicate that a series of tests involving the fundamental traits of mind essential to the successful study of English could be devised. But there are so many mental traits involved in the mastery of the subject of English that a series of tests bringing into play all those traits would undoubtedly be found to be a good test of general intelligence as well as a test of specific ability in English.

Summary and Conclusions

1. The results of an experiment in educational guidance, in which all the members of an VIII-A class about to enter high school were given mental tests and advised with reference to their first-year high-school work, proved very satisfactory. Compared with an unguided group it was found that while 31 percent of the unguided group failed in one subject, and 10 percent failed in two or more subjects during their first high-school year, only 18 percent of the guided group failed in one subject and none of them failed in two subjects. The mental tests aided in the discovery of the pupil's general level of intelligence, made possible the giving of sound educational advice at the time when it would do the most good, and thus tended to reduce the percent of failure and elimination. The methods employed can be adapted to the needs of any high school.

2. The general level of intelligence is shown to have real significance as a means of predicting success in a particular subject, such as algebra. In Table IX it was shown that 100 percent of those having I.Q.'s of 120 or over passed in their algebra, while 40 percent of those with I.Q.'s below 100 either failed or were conditioned in algebra, and only 26 percent of the members of this group earned college recommendation grades. The general level of intelligence could be relied upon as a means of selecting those who would be most likely to succeed in algebra and kindred subjects.

3. Success in a particular test of a series may be a fairly reliable index of success in a high-school subject involving the mental traits supposed to be measured by the test in question. High scores in the "word-relations" test of the Army Scale, Examinations *a* and *b,* correspond generally to high marks in first-year high-school English, while scores below twenty in the same test correspond generally to low marks in the same subject.

4. Mental tests for purposes of prognosis in individual high-school subjects such as algebra, English, etc., could no doubt be devised. But the mastery of any high-school subject involves such a complex of mental traits that any test which proves to be a good test of ability to succeed in one subject is quite apt to be found a good test of general mental ability. It has already been shown that a high-school pupil having a high level of intelligence will probably succeed in all of his subjects, and conversely that a pupil having a low level of intelligence is apt to fail in most of his high-school subjects. The best way, therefore, in which to arrive at an estimate of a given pupil's probable success in a specific high-school subject is to discover the general level of his intelligence. It follows that standardized mental tests may render invaluable service in the educational guidance of high-school pupils. Particularly will this be found to be true if the results of the mental test are interpreted in the light of other significant data, such as school marks made in previous grades, teachers' estimates of ability, and educational and vocational plans.

CHAPTER IV

STATUS OF ONE HUNDRED THIRTY-ONE CASES, TESTED WITH STANFORD REVISION OF BINET SCALE, AND FOLLOWED UP FOR PERIOD OF SIX YEARS

At a recent meeting of the National Research Council one of the points emphasized was the need for long time follow-up records on large groups of individuals who had been given tests with standard intelligence scales. The results of such a follow-up are set forth in this chapter. One group of high-school pupils, numbering 107, was tested with the Stanford Revision of the Binet Scale after entering high school in 1916,[1] and another group of VIII-A pupils, numbering 31, was given the same test before entering high school in 1917.[2] Five of the second group never entered high school and two of the first group did not stay long enough to make any tangible record. This leaves one hundred thirty-one who entered high school and stayed long enough to secure some sort of report on their scholastic effort. The first follow-up, made in April, 1919, is summarized in Chapter II, page 22, for the first group of 107, and in Chapter III, page 31, for the second group of 31.

The data included in this chapter represent the situation as it was found on June 1, 1923, seven years after the first group and six years after the second group had been given the psychological tests. All of the pupils who were still in high school in 1917-1918 were also given the U. S. Army Alpha or Examinations *a* and *b*. In the following tables an effort has been made to set forth all of the significant facts regarding the one hundred thirty-one cases which it has been possible to follow up. This information includes: Binet I.Q., Army Test I.Q., average high-school marks, father's occupation, vocational ambition while in high school, educational plan while in high school, time spent in

[1] See note 1, page 15, this Monograph.
[2] See page 30.

high school, present occupation if employed, sex, and institution attended if in a higher institution.

The data are treated in four tables: Table XI, where all the cases are arranged according to rank order by I.Q., on the Binet Scale; Table XII (a), thirty cases, those who did not complete high school; Table XII (b), thirty-four cases, those who did complete high school, but who did not go any farther with their education; Table XIII (a) and (b), sixty-seven cases, those attending higher institutions.

Before taking up the discussion of these tables a few general observations regarding the high school attended by the pupils under consideration, and the community in which it is located, will throw some light on the general character of the results disclosed. The Palo Alto Union High School District is made up of the elementary districts of Palo Alto, Mayfield, and Stanford University Campus, all of which are residential communities influenced as to character of population by the proximity of Stanford University. The influence of the university is shown in the educational plans of the high-school pupils, eighty-two of whom, or 63 percent, expressed a desire to attend institutions above the grade of Business College. The program of studies of the Palo Alto High School itself is predominantly academic and in the educational guidance given to pupils the College Entrance Curriculum is featured. The selective nature of the university on the Palo Alto high-school population is illustrated clearly in the results of this follow-up study. In the country at large not more than sixty out of one hundred thirty-one pupils entering high school would have graduated and not more than thirty would have gone on to higher institutions.[3] Of the one hundred thirty-one pupils who entered the Palo Alto Union High School as above indicated in 1916-17 and the January class of 1917-18, 101, or 77 percent graduated at the end of four years or less, and 67, or 51 percent, were in higher institutions of learning on June 1, 1923. Other results, characteristic of a uni-

[3] U. S. Bureau of Ed. Bulletin, 1919. No. 91. Pp. 229 and 239.

versity community, will be evident as the data presented in the four tables above referred to are analyzed.

A reasonably accurate follow-up, covering so long a period, has been made possible by the fact that the Palo Alto Union High School has had the same principal, Mr. Walter H. Nichols, and the same vice-principal, Miss Rebecca Green, since 1915. This fortunate circumstance made it possible for the writer and his two assistants, Miss Helen Ward and Miss Madeline Dallas, both graduate students in Stanford University, to secure readily any desired information.

1. *Discussion of Table XI.*—In this table all of the cases are arranged in rank order according to the results of the Binet test and in quarters. The summary of Table XI by quarters is significant from the standpoint of educational guidance. Of those who did not complete high school, 87 percent are found in the third and fourth quarters, (lower half); 13 percent in the second and none at all in the top quarter according to mental ability. Of those who went on to higher institutions, 78 percent are found in the top half of the distribution according to ability, and only 6 percent of such cases appear in the fourth or lowest quarter. Those who graduated from high school but did not go beyond occupy about a middle ground in the distribution, since 67 percent of them are found in the second and third quarters. Success in high-school studies seems to be directly related to mental ability, as shown by the median marks earned by the pupils in each quarter, i. e., B + for the first quarter, B for the second, B — for the third and C + for the fourth.

Sex differences in ability and in school success are shown in the last two columns of the general summary and the summary of high-school marks. There are 72 boys, and 58 percent of them are found in the top half of the distribution; while of the 59 girls, only 40 percent are found in the top half. The superior ability of the boys is further shown in that their median I.Q. on the Binet Scale is 109, while the median I.Q. of the girls is 103. When it comes to school achievement, however, the girls make the better showing. The median mark of the boys in the top

TABLE XI. ARRANGEMENT OF 131 CASES ACCORDING TO RANK ORDER OF I.Q. ON STANFORD REVISION OF BINET SCALE

Case No.	I. Q. Binet	I. Q. Group	H. S. Marks	Status in June, 1923	Sex
Top or First Quarter					
1	142	...	B	University	B
2	137	148	C+	University	B
3	137	140	B+	University	B
4	135	132	A−	University	B
5	134	140	B−	University	B
6	134	134	B	University	B
7	133	132	B	University	G
8	132	130	B+	University	B
9	132	116	B−	University	B
10	131	145	A−	University	B
11	131	130	A−	University	G
12	131	...	B+	University	G
13	129	124	B	University	B
14	128	133	B+	Gr. HS. Bus.	B
15	127	138	B+	University	B
16	127	128	B−	University	B
17	125	141	A	University	G
18	125	135	A	University	B
19	125	128	B	University	G
20	124	132	A−	University	B
21	124	132	B	University	B
22	123	133	B+	University	B
23	123	127	B	University	B
24	123	120	B−	University	B
25	123	...	A−	University	B
26	122	127	B−	University	G
27	122	110	B	Normal Sch.	G
28	122	109	B	Agri. Col.	B
29	121	130	B−	Gr. HS. Bus.	G
30	121	...	B+	University	B
31	120	128	B+	University	G
32	119	130	A−	Gr. HS. Bus.	G
33	119	124	B	University	B
Second Quarter					
34	119	110	C+	University	B
35	118	126	B+	Gr.HS.Mar.	G
36	118	115	A−	University	B
37	118	102	B+	University	B
38	118	...	B	University	G
39	117	120	B+	Gr.HS.Mar.	G
40	116	118	C	HS. 1yr. Lab.	B
41	116	112	C+	University	B
42	116	107	B+	University	G
43	115	125	B	University	B
44	115	108	B+	University	G
45	115	106	B	University	B
46	115	...	B−	University	B
47	114	112	C+	HS. 3yr. Bus.	B
48	114	...	A−	University	B
49	113	125	C+	Gr. HS. Art	G
50	113	118	B+	Gr. HS. Mar.	G
51	113	101	C	Gr. HS. Bus.	B
52	112	115	B	University	G
53	112	113	B−	HS.3½yr.Hm.	G
54	112	108	B	University	B
55	111	113	A−	University	G
56	111	95	C+	University	G
57	110	120	B	University	B
58	110	115	B+	University	G
59	110	112	B	University	G
60	110	107	B+	Gr. HS. Bus.	G
61	109	...	B	University	B
62	109	...	B−	Gr. HS. Bus.	B
63	108	115	B−	University	B
64	107	101	B+	University	B
65	107	...	C	HS. 2yr.Mech.	B
66	106	108	A−	University	B
Third Quarter					
67	106	104	C+	Gr. HS. Mar.	G
68	106	102	C	Gr. HS. Lab.	B
69	105	107	B+	University	B
70	105	...	D	HS. 1yr. Bus.	B
71	104	124	C+	University	B
72	104	107	B	Gr. HS. Mar.	G
73	104	101	C+	Gr. HS. Mar.	G
74	103	121	B	University	G
75	103	104	B	University	G
76	103	101	B	HS.2½yr. Bus.	G
77	103	97	B	University	B
78	102	114	B+	Gr. HS. Bus.	G
79	102	112	C	Gr. HS. Mech.	B
80	102	...	C	Gr. HS. Bus.	G
81	101	117	B	University	G
82	101	...	B	University	G
83	100	122	B+	University	G
84	100	120	D+	HS. 1yr. Mar.	G
85	100	109	D+	Gr. HS. Bus.	G
86	100	104	B	Gr. HS. Mar.	G
87	100	101	Inc.	HS. ½yr. Lab.	B
88	100	101	B	Gr. HS. Bus.	G
89	100	101	B−	Gr. HS. Bus.	B
90	99	108	C+	Gr. HS. Bus.	B
91	99	...	C+	HS. 1yr. Hm.	G
92	98	115	B−	Gr. HS. Mech.	B
93	98	112	B	Gr. HS. Bus.	B
94	98	112	D+	HS. 2yr. Bus.	B
95	98	110	B	Gr.HS.Bk-kp.	G
96	98	100	C−	University	B
97	97	104	B−	Normal Sch.	G
98	97	103	C	Gr. HS. Bus.	B
99	97	102	B−	University	G
Fourth Quarter					
100	97	...	B−	HS. 1yr. Lab.	B
101	97	92	C+	HS. 3yr. Hm.	G
102	97	91	C	HS. 1yr. Lab.	B
103	96	99	B	Gr.HS. Nurse	G
104	96	...	C−	HS. 1yr. Mar.	G
105	95	110	B−	Gr. HS. Bus.	B
106	95	97	B	Gr. HS. Bus.	G
107	94	115	C+	Gr. HS. Bus.	G
108	94	107	C	HS.2½yr.Sew	G
109	94	...	D	HS. 1yr. Lab.	B
110	93	125	B	University	B
111	93	112	C+	University	B
112	93	101	C+	University	B
113	93	95	B	University	B
114	92	...	C	HS. ½yr. Hm.	G
115	91	103	B	Gr. HS. Bus.	G
116	91	97	B−	HS. 3yr. Bus.	G
117	91	...	C−	HS. 1yr. Mar.	G
118	90	102	B−	Gr. HS. Bus.	B
119	90	90	C+	Gr. HS. Bus.	B
120	90	...	Inc.	HS. ½yr. Lab.	B
121	90	89	C−	HS. ½yr. Mar.	G
122	89	97	B−	Gr. HS. Bus.	B
123	88	...	C+	HS.½yr.Bus.	B
124	88	80	D+	HS.2yr.Mar.	G
125	87	...	D+	HS.3½yr.Lab.	B
126	87	95	D+	HS. 1yr. Lab.	B
127	85	...	D+	HS.2yr.Carp.	B
128	85	90	B	HS.2yr.Mar.	G
129	83	...	D	HS.1½yr.Hm.	G
130	82	...	C−	HS.½yr.Mar.	G
131	79	...	C+	HS. ½yr. Hm.	G

Explanation of abbreviations in Table XI. "University," means any standard College or University. Specific institutions named in Tables XII and XIII. "Gr. HS. Bus.", means graduated from High School and now engaged in some Trade or Commercial occupation. "HS. 1yr. Bus.", means left high school at end of one year and now engaged in Trade or Commercial occupation. "Mar.", means, married. "Hm.", means at home, occupation not known. "Mech.", means engaged in some mechanical occupation. "HS. 1yr. Lab.", means, left high school at the end of one year and now engaged in unskilled labor.

quarter is B; that of the girls is B +. In the second quarter the median mark of the boys is B —; that of the girls B. Considering all the cases, we find the median high-school mark of the boys to be B —, equivalent to 80 percent, and that of the girls to be B, equivalent to 85 percent. Eleven percent of the boys and seven percent of the girls made straight A or A — records during their high-school courses. It should be noted that all of these A and A — records were made by pupils in the top half of the distribution, and that 75 percent of such records were made by those in the top quarter.

2. *Discussion of Table XII (a).*—Data regarding high-school pupils who did not finish their high-school education are

GENERAL SUMMARY OF TABLE XI BY QUARTERS

(Showing number and percent of cases in each quarter withdrawing from H. S., graduating from H. S., in higher institutions, etc.)

Quarter	Did not graduate from H. S.		Grad'ted from H.		Now in higher institution		Median I.Q.		Median H. S. Marks		Number of Cases				Total
											Boys		Girls		
	No.	%	No.	%	No.	%	Binet	Group	%	Letter	No.	%	No.	%	
1st, (top)..	0	00.	3	9.	30	45.	125	128	87.	B+	23	32.	10	17.	33
2nd.....	4	13.	7	20.	22	33.	113	112	85.	B	19	26.	14	23.	33
3rd.....	6	20.	16	47.	11	16.	100	107	80.	B−	14	20.	19	33.	33
4th.....	20	67.	8	24.	4	6.	91	97	78.	C+	16	22.	16	27.	32
	30	100.	34	100.	67	100.	106	109	84.	B	72	100.	59	100.	131

SUMMARY OF HIGH-SCHOOL MARKS (TABLE XI) BY QUARTERS

Marks	Boys					Girls					Total
	Quarters				Total	Quarters				Total	
	1	2	3	4		1	2	3	4		
A, A−	5	3	0	0	8	3	1	0	0	4	12
B+	5	2	1	0	8	3	6	2	0	11	19
B	7	4	2	2	15	3	3	9	4	19	34
B−	5	4	2	4	15	1	2	2	1	6	21
C+	1	3	2	4	10	0	2	3	3	8	18
C	0	3	3	1	7	0	0	1	2	3	10
C−	0	0	1	0	1	0	0	0	4	4	5
D+, D	0	0	2	4	6	0	0	2	2	4	10
E, Inc.	0	0	1	1	2	0	0	0	0	0	2
Totals.....	23	19	14	16	72	10	14	19	16	59	131
Median H. S. Mark, Boys "B−", or 80%. Median I. Q., Boys, Binet, "109".						Median H. S. Mark, Girls "B", or 85%. Median I. Q., Girls, Binet, "103".					

assembled in Table XII (a). In the summary of Table XI it appeared that 87 percent of those who did not complete their high-school course were found in the lower half of the ability distribution. In Table XII (a) we note that the median I.Q. of the group is 94, with the range of the middle 50 percent from 88 to 99. If an intelligence quotient of 95 is taken as the lower limit of average ability, then 50 percent of the cases in this table have less than average ability.

Achievement in high-school subjects is likewise found to be below average. On a percentile basis the median mark for the entire 131 cases falls at 84 percent, which is nearer a B than a B—. The median mark for the 30 cases in Table XII (a) is C—, or 70 percent—14 points below the average for the entire group. Thirty percent of the pupils in this group have marks of D+, D, E, or Incomplete. An average of D+ implies failure in about one-half of the subjects taken, where the pupils were in school more than one-half of a school year, or a very low grade of work in all subjects taken.

The relation of school progress and intelligence to social status will be taken up later, but it should be observed in passing that 30 percent of the pupils reported in Table XII (a) did not give their fathers' occupations, and that 63 percent did not give either vocational ambitions or educational plans, although they were asked to give all these data at the time the mental tests were given.

A final point of interest in this table is the length of time spent in high school. Six dropped out at the end of the first half year, and five of these had I.Q.'s below 94. An additional 11 dropped out by the end of the first year, making 57 percent of elimination after one school year. Seven more were eliminated by the end of the second year, making a total elimination of 80 percent up to that time. The remaining six pupils secured 2½, 3, or 3½ years of high-school training before dropping out. Investigation of individual cases fails to reveal any pronounced relationship between the economic status of the home and the elimination of the pupil. The outstanding causes appear to be:

TABLE XII. (a) DATA REGARDING 30 CASES OF PUPILS WHO DID NOT COMPLETE HIGH SCHOOL

(Cases ranked according to I.Q. on Stanford Revision of Binet Scale)

Case No.	Sex	I. Q. Binet	I. Q. Group	Average H. S. marks	Father's occupation	Vocational ambition in H. S.	Educational plan in H. S.	Time in H. S. (years)	Occupation June, 1923
1	B	116	118	C	Gardener	Farmer	Not given	1	Labor, unsk.
2	B	114	112	C+	Not given	Not given	Bus. Col.	3	Salesman
3	G	112	113	C+	Clerical	Priv. Secy.	Bus. Col.	3	Ret. H. S.
4	B	107	...	C	Carpenter	Not given	Not given	2	Auto mech.
5	G	103	101	B	Bus. retired	Not given	University	2	Office wk.
6	B	103	...	D	Contractor	Not given	Not given	1	Collector
7	B	100	101	Inc.	Not given	Engineer, El.	University	½	Labor, unsk.
8	G	100	120	D+	Engineer, st.	Missionary	Med. School	1	Housewife (mar.)
9	G	99	...	C+	Not given	Not given	Not given	1	Not known
10	B	98	112	D+	Paint store	Not given	Not given	2	Clerk, paint st.
11	G	97	92	C+	(m) Nurse	Nurse	Not given	3	At home
12	B	97	91	C	Not given	Mechanic	H. S. only	1	Labor, unsk.
13	B	97	...	B−	Not given	Not given	Not given	1	Labor, unsk.
14	G	96	...	C−	Carpenter	Not given	Not given	1	Housewife (mar.)
15	G	94	107	C	Sea Captain	Dressmaker	H. S. only	2½	Dressmaker
16 med.	B	94	...	D	Not given	Not given	Not given	1	Labor, unsk.
17	G	92	...	C	Farmer	Not given	Not given	½	Not known
18	G	91	97	B−	Gardener	Stenog.	Bus. Col.	3	Office wk.
19	G	91	...	C−	Contractor	Not given	Not given	1	Housewife (mar.)
20	B	90	...	Inc.	Not given	Not given	Not given	⅓	Labor, unsk.
21	G	90	89	C−	Contractor	Chemist	Mills Col.	½	Housewife (mar.)
22	B	88	...	C+	Contractor	Not given	Not given	½	Office wk.
23	G	88	80	D+	Nt. watchman	Not given	Not given	2	Housewife (mar.)
24	B	87	...	D+	Not given	Not given	Not given	3½	Labor, unsk.
25	G	85	...	B	Towboat, Cap.	Teacher	Normal	2	Housewife (mar.)
26	B	85	95	D+	Truckdriver	Not given	Not given	1	Gardener
27	B	85	...	D+	Contractor	Not given	Not given	2	Carpenter
28	G	83	...	D	Real estate	Not given	Not given	1½	Not known
29	G	82	...	C−	Not given	Not given	Not given	1	Housewife (mar.)
30	G	79	...	C+	Not given	Stenog.	Bus. Col.	½	Not known

(a) lack of mental ability, leading to poor school work; (b) lack of interest in school tasks, also resulting in poor school work; (c) social (not economic) status of the home. As to this last point, it was found that 85 percent of the 20 cases where the occupation of the father was given came from homes where the father's occupation ranked III or IV on the Barr Scale.[3] This scale bases occupational ranking on the ability necessary for success, and not, as in the case of the Taussig Scale, on economic return. Hence the rank given according to the Barr Scale is more an indication of social than of economic status.

3. *Discussion of Table XII (b).*—In this table we have a presentation of data regarding thirty-four pupils who graduated from high school but who did not continue their education beyond that point. The mental ability of this high-school-graduation-only group is about midway between that of the left-school-to-go-to-work group and that of the entered-higher-institutions group, since 67 percent of the cases are found in the second and third quarters of the distribution in Table XI. The median I.Q. of this group is 100 according to the Binet Scale, but according to the group test the median is 107. When both the individual and group tests are considered, only four cases fall below 100 on both scales, and only one of these below 95 on both scales. This would indicate that only those of average ability or better will probably complete four years of high school. Compared with the left-school-to-go-to-work group they rank six points higher on the intelligence (Binet) tests—still higher if group tests are considered—and in school work their median mark was B—, 80 percent compared with C—, 70 percent for the left-school group.

In social status the high-school graduation group stands higher than the left-school group. The occupation of the father is given in 29 of the 34 cases; and the occupational rank in 18, or 62 percent, of these cases is III or IV, compared with 85 percent of the same ranks for the left-school group.

[3] See Appendix No. III., p. 122.

In addition to the fact that 23 percent more of the high-school graduation group had fathers with occupational ranks of II or better, and a higher average intelligence than the left-school group, another factor may have had some influence on the tendency to complete high school, i. e. the cherishing of definite vocational and educational plans. Twenty-eight, or 82 percent, of the high-school graduation group entertained vocational ambitions, and 25 of them, or 73 percent, had educational plans requiring high-school graduation. On the other hand, 63 percent of the left-school group had no such plans, or at least were not sufficiently interested to indicate what they might be, when given an opportunity to do so. That there is a direct correlation between educational plans involving graduation from high school, and tendency to complete four years of high-school work is supported by the studies of Vandenberg.[4] The inference is at least plausible that if all high-school pupils were given guidance in the formulation of educational and vocational plans, more of those of average or better than average ability would remain in high school until the four-year course was completed, while those of below average ability would at least be helped to devote their time in high school to subjects more suited to their needs than the ones most of them now attempt and fail in. Lack of proper guidance is without doubt a factor too often entirely overlooked in discussions of elimination.

4. *Discussion of Table XIII (a) and (b).*—The 67 cases of those who completed high school and then continued their education in higher institutions are considered in Tables XIII (a) and (b). The 47 now attending Stanford University are included in (a), and the 20 attending other institutions in (b). The Stanford group was treated separately because it selects both men and women students on the basis of scholarship, and because records indicating success in university work were available for the Stanford cases.

[4] Inglis, Alexander, J. *Principles of secondary education.* Boston, Houghton Mifflin, 1918. p. 137.

TABLE XII. (b) DATA REGARDING 34 PUPILS WHO GRADUATED FROM HIGH SCHOOL BUT DID NOT CONTINUE EDUCATION

(Cases ranked according to I.Q. on Stanford Revision of Binet Scale.)

Case No.	Sex	I.Q. Binet	I. Q. Group	Average H. S. marks	Father's occupation	Vocational ambition in H. S.	Educational plan in H. S.	Occupation, June, 1923
1	B	128	133	B+	Nt. watchman	Lawyer	University	Clerical wk.
2	G	121	130	B−	Salesman	Stenog.	Bus. Col.	Office wk.
3	G	119	130	A−	Carpenter	Stenog.	University	Office wk.
4	G	118	126	B+	Not given	Stenog.	Bus. Col.	Housewife (mar.)
5	G	117	120	A−	Not given	Stenog.	Bus. Col.	Housewife (mar.)
6	G	113	125	C+	Carpenter	Not given	Not given	Art shop
7	B	113	101	C+	Contractor	Machinist	University	Clerical wk.
8	G	113	118	B+	Carpenter	Stenog.	Bus. Col.	Housewife (mar.)
9	G	110	107	B+	Mine Supt.	Journalist	University	Office wk.
10	B	109	...	B−	Real estate	Not given	Not given	Bank clerk
11	B	106	102	C+	Butcher	Mech. Eng.	University	Labor, unsk.
12	G	106	104	C+	Real estate	Not given	Not given	Housewife (mar.)
13	G	104	101	C+	Auto dealer	Nurse	Med. Sch.	Housewife (mar.)
14	G	104	107	B	Farmer	Teacher	Normal	Housewife (mar.)
15	B	102	112	C	Restaurant	Not given	Not given	Electrician
16	G	102	...	C	Not given	Stenog.	Bus. Col.	Telephone op.
17	G	102	114	A−	Engineer	Stenog.	Bus. Col.	Stenographer
18 md.	G	100	109	D+	H. S. Teacher	Teacher	Normal	Office wk.
19	G	100	104	B	Real estate	Druggist	Pharmacy Sch.	Housewife (mar.)
20	G	100	101	B	Butcher	Teacher	Normal	Drug clerk
21	B	100	101	B−	Carpenter	Elect. Eng.	University	Gas Serv. Sta.
22	B	99	108	C+	City Treas.	Not given	Not given	Salesman
23	G	98	110	B	Engineer	Stenog.	Bus. Col.	Bk. keeper
24	B	98	112	B	Farmer	Priest	Theol. Sem.	Clerical wk.
25	B	98	115	B−	Not given	Not given	Not given	Truck driver
26	B	97	103	C	Painter	Mech. Eng.	University	Salesman
27	G	96	99	B	Ship-joiner	Bk. keeper	Bus. Col.	Nurse
28	G	95	97	B	Cabinet-mkr.	Stenog.	Not given	Bank clerk
29	B	95	110	B−	Mail carrier	Mech. Eng.	University	Office wk.
30	G	94	115	C+	Furniture	Teacher	Normal	Office wk.
31	G	91	103	B	Teamster	Stenog.	Not given	Stenographer
32	B	90	102	B−	Contractor	Mech. Eng.	University	P. O. clerk
33	B	90	90	C+	Not given	Not given	Not given	Salesman
34	B	89	97	B−	Cabinet-mkr.	Mech. Eng.	University	Mec. Draughtmn

TABLE XIII. DATA REGARDING 67 PUPILS WHO GRADUATED FROM HIGH SCHOOL AND CONTINUED THEIR EDUCATION IN HIGHER INSTITUTIONS

(a) *Those now attending Stanford University*

Case No.	Sex	I. Q. Binet	I. Q. Group	Average H. S. marks	Father's occupation	Vocational ambition in H. S.	Educational plan in H. S.	Graduated from H. S. in:	University marks
1	B	142	...	B	Civ. Eng.	Civ. Eng.	University	4 years	B+
2	B	137	140	B+	Physician	Mech. Eng.	University	4 "	C+
3	B	135	132	A−	Farmer	Farmer	University	4 "	B+
4	B	134	140	B−	Lumber Mer.	Banking	University	4 "	D−
5	B	134	134	B	Univ. Prof.	Mech. Eng.	University	4 "	C+
6	G	133	132	B	Univ. Prof.	Housewife	University	4 "	C+
7	B	132	130	B+	Univ. Prof.	Not given	University	4 "	C+
8	B	131	145	A−	R. R. Pres.	Mech. Eng.	University	3½ "	A−
9	G	131	130	A−	Not given	Teacher	University	4 "	B+
10	G	131	...	B+	Univ. Prof.	Teacher	University	4 "	C+
11	B	129	124	B	Real estate	Lawyer	University	4 "	C
12	B	127	138	B+	Transfer bs.	Mus. Teacher	University	4 "	B−
13	B	127	128	B−	Real estate	Naval Offic.	Annapolis	4 "	C−
14	B	125	135	A	Real estate	Chemist	University	3½ "	A−
15	G	125	128	B	Univ. Prof.	Physician	University	4 "	C+
16	B	124	132	B	Not given	Mech. Eng.	University	4 "	D−
17	B	124	132	A−	Minister	Not given	University	4 "	B
18	B	123	133	B+	Physician	Mech. Eng.	University	4 "	B−
19	B	123	127	B	Univ. Prof.	Mech. Eng.	University	4 "	C+
20	B	123	...	A−	Min. Eng.	Min. Eng.	University	4 "	C
21	G	122	127	B−	(m) Stenog.	Not given	University	4 "	C

TABLE XIII. (a) (*Continued*)

Case No.	Sex	I. Q. Binet	I. Q. Group	Average H. S. marks	Father's occupation	Vocational ambition in H. S.	Educational plan in H. S.	Graduated from H. S. in:	University marks
22	B	121	...	A−	Univ. Prof.	Not given	University	4 "	B+
23	G	120	128	B+	Univ.Prof.	Not given	University	4 "	B+
24 m.	B	119	124	B	Auto dealer	Farmer	University	4 "	C+
25	B	119	110	C+	Univ. Prof.	Not given	University	4 "	C+
26	B	118	115	A−	Minister	Mech. Eng.	University	4 "	A−
27	B	118	102	B+	Univ. Prof.	Mech. Eng.	University	4 "	B−
28	G	118	...	B	Banker	Not given	University	4 "	D
29	G	116	107	B+	Hdw. Merchant	Not given	University	4 "	B
30	B	115	125	B	Hotel owner	Chem. Eng.	University	4 "	C
31	G	115	108	B+	Lawyer	Not given	University	4 "	B−
32	B	115	...	B−	Min. Eng.	Not given	University	4 "	C
33	B	114	...	A−	Teacher H. S.	Not given	University	4 "	B+
34	G	112	115	B	Stock farm	Private Sec.	University	4 "	C+
35	B	112	108	B	Hdw. Merchant	Mech. Eng.	University	4 "	C
36	G	111	113	A−	Butcher	Teacher	University	4 "	C+
37	B	110	120	B	Physician	Physicain	University	4 "	D
38	G	110	115	B+	Creamery	Lawyer	University	4 "	C
39	B	108	115	B−	Creamery	Civ. Eng.	University	4 "	C+
40	B	106	108	A−	State Officer	Elect. Eng.	University	4 "	B−
41	B	105	107	B+	Merchant	Not given	Not given	4 "	C
42	B	103	97	B	Wool broker	Mechanic	Bus. Col.	4 "	C−
43	G	101	...	B	Not given	Not given	Not given	4 "	C−
44	G	100	122	B+	Univ. Prof.	Teacher	University	4 "	B−
45	B	93	125	B	Merchant	Physician	University	4 "	C+
46	B	93	101	C+	Wool broker	Not given	Not given	4 "	C
47	B	93	95	B	Lawyer	Lawyer	University	4 "	C

TABLE XIII. (a) (*Continued*)

(b) *Institutions other than Stanford University*

Case No.	Sex	I. Q. Binet	I. Q. Group	Average H. S. marks	Father's occupation	Vocational ambition in H. S.	Educational plan in H. S.	Graduated from H. S. in:	Attending in 1922–23
1	B	137	148	C+	Lawyer	Scientist	University	4 years	Col. of Pac.
2	B	132	116	B−	Real estate	Naval Off.	Nav. Academy	4 "	Annapolis
3	G	125	141	A	Civ. Eng.	Lawyer	University	4 "	U. of Calif.
4	B	123	120	B−	Salesman	Civ. Eng.	University	4 "	U. of Calif.
5	G	122	110	B	Salesman	Not given	Not given	4 "	S. J. Normal
6	B	122	109	B	Minister	Sci. Farmer	Agri. Col.	4 "	Davis Farm Sch.
7	B	116	112	C+	Creamery	Civ. Eng.	University	4 "	U. of Calif.
8	B	115	106	B	Wh'sl. Mer.	Farmer	Agri. Col.	4 "	U. of Calif.
9	G	110	112	B	Physician	Mus. Teacher	Cons. Music	4 "	S. J. Normal
10	G	110	95	C+	Cement Cont.	Nurse	University	4 "	S. J. Normal
11 m.	B	109	113	B	Not given	Not given	Not given	4 "	Univ. of Wash.
12	B	107	101	B+	Salesman	Musician	University	4 "	S. J. Jr. Col.
13	B	104	124	C+	Transfer Bus.	Civ. Eng.	Tech. Sch.	4 "	Hopkins Art Sc.
14	G	103	121	B	Salesman(Hdw.)	Priv. Secy.	University	4 "	U. of Calif.
15	G	103	104	B	Not given	Mus. Teacher	Cons. Music	4 "	Mills College
16	G	101	117	B	Minister	Tr. Nurse	Med. Sch.	4 "	Col. of Pac.
17	B	98	100	C	Not given	Not given	Not given	4 "	U. of Calif.
18	G	97	104	B−	Orchardist	Teacher	Normal	4 "	S. J. Normal
19	G	97	102	B−	Banker	Teacher	Univ. or Norm.	4 "	U. of Calif.
20	B	93	112	C+	Merchant	Mech. Eng.	Sch. of Eng.	4 "	Col. of. Pac.

(a) Thirty-three of the Stanford cases were boys and 14 were girls. The median I.Q. of the boys was 121; of the girls, 116; of both together, 119. The median high-school mark of the Stanford boys was B, 85 percent; of the girls, B+, 88 percent, of both, B+, 88 percent. The median university mark of the boys was C+, 78 percent; of the girls, C+, 78 percent; of both together, the same. In explanation of the relatively low university marks, compared with the high-school marks, it may be said that most of the Stanford cases are just completing their first year of university work and have had many new adjustments to make. The three boys making A— records in the university are of the first group tested in 1916-17. Two of them completed high school in 3½ years and are now juniors. The other one has completed his sophomore year.

(b) Eleven of the 20 pupils attending other higher institutions than Stanford were boys and nine girls. The boys attained a median I.Q. of 115; the girls, 103; both, 109. The median high-school mark of the boys was B—, 80 percent; of the girls, B, 85 percent; of both, B—, 80 percent. Combining the two sections, we have 44 boys with a median I.Q. of 119 and a median high-school mark of B, 85 percent; and 23 girls with a median I.Q. of 112 and a high-school mark of B, 85 percent. The median I.Q. of the entire group of 67 boys and girls in higher institutions was 118, and the median high-school mark, B, or 85 percent.

The influence of social status on tendency to go on to higher institutions is much more evident in the case of the group under discussion than in relation to either of the other groups. We have noted above that only 15 percent of the left-high-school group and 38 percent of the high-school-graduation group had fathers whose occupations ranked I or II. Forty-four of the students now in Stanford gave fathers' occupation, and 42 of these, or 95 percent, ranked I or II. Seventeen of those in other institutions gave fathers' occupation, and 12 of these, or 70 percent, ranked I or II. Sixty-one of the combined groups gave fathers' occupations, and 54, or 89 percent, had occupations

ranking I or II. The difference between the first two groups and the third, in the matter of social status, is so striking as to leave little doubt concerning the part played by that factor in the selection of those who go on to higher institutions. In other words, when we find that eight out of ten of those who left school before completing the course and six out of ten of those who just graduated from high school come from a social status represented by fathers' occupational rank of III or IV, while approximately nine out of ten of those continuing their education

SUMMARY OF TABLES XII (a) AND (b) AND XIII (a) AND (b), WITH REFERENCE TO INTELLIGENCE OF PUPILS AND RANK OF FATHERS' OCCUPATIONS ON THE BARR SCALE FOR MEASURING VOCATIONAL STATUS

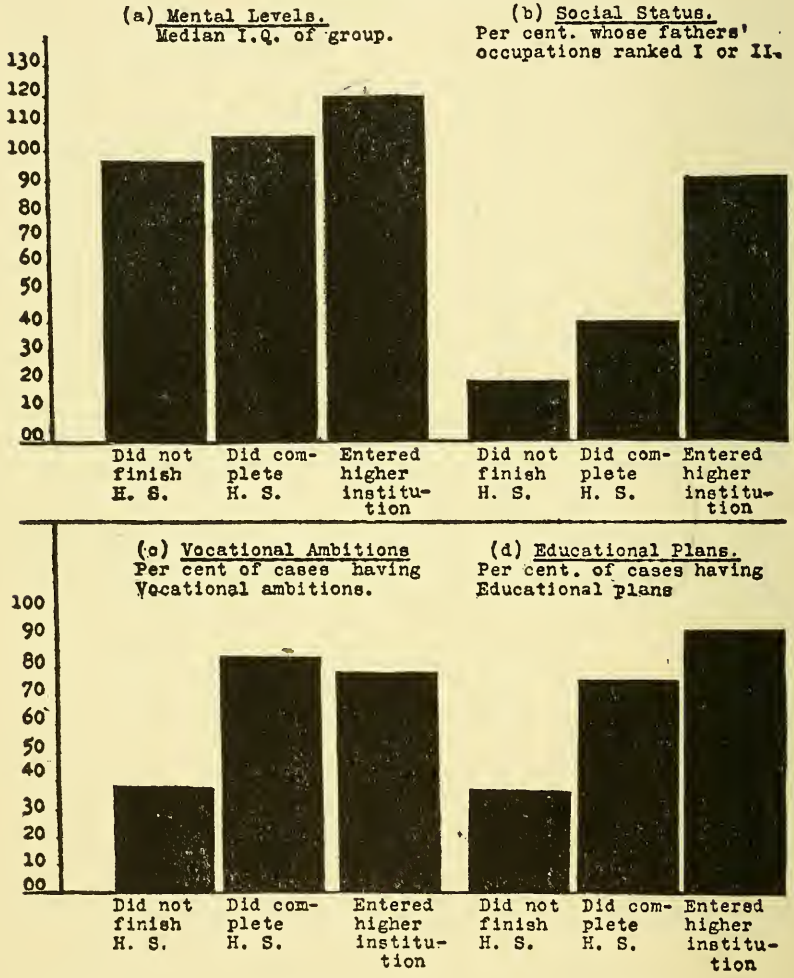
I. Q. of Pupils	Rank of Fathers' Occupation on Barr Scale					Total	Median Rank
	V	IV	III	II	I		
125 or over	0	1	0	10	7	18	II
115–124	0	0	7	8	10	25	II
105–114	0	0	9	9	3	21	II
95–104	0	1	14	11	2	28	III
79–94	0	2	9	7	0	18	III
Totals	0	4	39	45	22	110	II
Percents	0.0	3.6	35.4	41.0	20.0	100.0	

beyond high school come from a social status represented by fathers' occupational rank of I or II, we are warranted in according social status a prominent place among the factors which determine the probable educational future of a given high-school pupil.

The tendency, frequently noted by investigators, for a positive correlation to be found between general intelligence and social status, is discoverable in the data presented in the three tables already discussed. This will be evident from the following summary:

None of the 110 giving fathers' occupation has a father with an occupational ranking of V. Only 3.6 percent have occupations ranking IV. Sixty-four of the pupils have I.Q.'s ranging

FIGURE 3. COMPARISONS OF GROUPS "NOT COMPLETING HIGH SCHOOL," "COMPLETING HIGH SCHOOL ONLY," AND "GOING TO HIGHER INSTITUTIONS"



from 105 to 142, comprising the groups, "better than average," "superior," and "very superior." The fathers' occupation in 47 of these cases, or 75 percent, ranks I or II. There are 46 cases with I.Q.'s ranging from 79 to 104, embracing the average and below average groups in ability. Twenty of these have fathers

with occupational ranking of I and II, making 43 percent for the "average" and "below average" I.Q. groups, compared with 75 percent for the three upper groups. While the range of fathers' occupations is too limited to yield a high coefficient of correlation between social status and the intelligence of children, these data at least support the conclusion that where there is a combination of high intelligence and superior social status great impetus is given to the "go-on-to-college" idea.

When we compare the vocational ambitions of the in-higher-institutions group with those of the graduation-from-high-school group, we find 82 percent of the latter indicating vocational preferences, and 78 percent of the former. But when it comes to signifying definite educational plans, 91 percent of the college group and only 73 percent of the high-school group outlined plans for education beyond high school. Again, of those among the college group who told of their educational plans, 89 percent are now carrying out the identical plans mentioned by them when they were first-year high-school students. This is a still further confirmation of the previously suggested conclusion that definite plans, in mind at the beginning of a high-school course, tend to stimulate those expressing them to continue in training until the plans are consummated. When to definiteness of vocational and educational plans are added the further factors of better than average ability and superior social status the chances become eight or nine to one that the plans and ambitions will be carried out successfully.

5. *The value of two mental scales.*—A word should be added regarding the advantage of having at least two tests of mental ability before assuming that anything approaching an accurate indication of the individual's mental ability has been discovered. In 105 of the 131 cases discussed in this chapter, both the Binet and a group test were given. A glance at Table XI, where all the cases are assembled according to rank on the Binet Scale, will indicate a very marked agreement between the two tests; but a sufficient amount of disagreement will also be found to suggest caution in basing judgments on a single test. Fifteen

points on the Alpha Scale, according to the Kohs-Proctor norms, constitute the equivalent of a mental-age year. Using this standard of variation on the 105 cases in Table XI, where both tests were applied, we find that in only 13 cases, or 12 percent of the total, was there a difference greater than the equivalent of one mental-age year.

One or two illustrations will suffice to show the advantage of the two tests from a guidance point of view. Cases 110, 111, 112 and 113, Table XI, all tested I.Q., 93 on the Binet Scale, and an assumption might have seemed valid that they did not represent promising university material. On the group test, however, they earned I.Q.'s of 125, 112, 101, and 95, respectively. All of them came from homes where the rank of the fathers' occupation was I or II, and they are all now in college—three of them in Stanford and one in the College of the Pacific, at San Jose, California. On the other hand, where both tests agree either on the high or the low I.Q. basis, the school work and educational destiny revealed by the sixth year follow-up usually correspond. Cases 2 to 11, inclusive, all stood high on both tests, and all of them are now found in the university. Cases 121, 124, 126, and 128, all made low scores on both tests. None of them completed more than two years of high school. In any event, whether the tests agree or not, the test results should be considered as tentative, not final, and the counselor's attitude should constantly be that of open-mindedness. Test results must themselves be thoroughly tested against other valid criteria.

Summary and Conclusions

1. The discussion covers cases of 131 high-school pupils, tested with Binet and group scales in 1916-17 and 1917-18, and followed up until June 1, 1923.

2. The influence of a university community is evident in the fact that 77 percent of the 131 graduated from high school and 66 percent of the high-school graduates went on to higher institutions, compared with 35 percent graduating and 42 percent of

high-school graduates going to higher institutions in the country at large.

3. Arrangement of all cases in rank order, Table XI, brings out the fact that 87 percent of the cases in the did-not-complete-high-school group were in the lower half of the distribution; that 67 percent of those who did not go beyond high school were found in the second and third quarter; and that 78 percent of those going to higher institutions were found in the top half.

4. The median I.Q. of those who did not complete high school, Table XII (a), was found to be 94. The median high-school mark was 14 points below the median for the entire group of 131. Neither educational nor vocational plans were indicated by 63 percent of this group. Elimination of 80 percent had taken place by the end of the second high-school year. Lack of mental ability, lack of interest, and social status were the most potent causes of elimination.

5. The group completing high school only, Table XII (b), had a median I.Q. of 100 and a median school mark of 80 percent. Occupations of 38 percent of the fathers ranked I or II. Vocational ambitions were expressed by 82 percent and educational plans by 73 percent of the cases. Average ability and better than average social status were factors in ensuring high-school graduation.

6. The 67 cases continuing education in higher institutions, Table XIII, were found to have a median I.Q. of 118 and an average high-school mark of 85 percent. The occupations of fathers ranked I and II in 89 percent of the cases. Positive correlation was also found between the father's occupation and the intelligence of the child. Average or better than average ability and superior social status appear to be the most vital factors in determining continuation of education beyond high school.

7. Marked agreement between Binet and Group I.Q.'s was found. In 92 of 105 cases where both tests were applied—88 percent—there was agreement within one mental-age year. Cases where one test indicated a low level of ability and the other an average or higher level are found doing college work success-

fully. Where both tests agree, either high or low, subsequent educational progress tends to bear out the diagnostic implications of the mental tests. In any event, tests should be measured against other valid criteria.

CHAPTER V

THE USE OF PSYCHOLOGICAL TESTS IN THE VOCATIONAL GUIDANCE OF HIGH-SCHOOL PUPILS

The use of psychological tests as a basis for the prediction of probable school success, and in the educational guidance of high-school pupils has been discussed in Chapters II, III and IV. The use of such tests in the vocational guidance of high-school pupils will be discussed in this chapter.

The Employment Manager and the Vocational Counselor

The application of psychological tests to the selection of men for particular jobs is well along in the experimental stage.[1] The employment manager has demonstrated the value of such tests when used in the selection of employees. If the tests are carefully devised to discover whether the applicants have certain essential mental qualifications for the kind of work they will be called upon to perform, and if final selection is made from the few who make high scores in the tests, the results are likely to be satisfactory to the employer. When in addition to specific mental tests, appropriate trade or performance tests are given, the employment manager or personnel expert can select from the highest 25 percent of applicants with reasonable assurance that they will make good at the tasks assigned to them. These tests tend effectively to sift out the undesirables, to reduce the amount of labor turnover, and to secure for the employer a higher grade of employees.

The person who selects men for a particular occupation needs only to know the qualifications for success in that occupation. He can plan his tests with a view to eliminating all those who do not measure up to the established standard. If only five out of one hundred applicants are selected and they all prove to be

[1] Link, H. C. *Employment psychology.* New York: Macmillan Co., 1919.

adapted to their work the tests by which they were selected are counted as satisfactory. The ninety-five rejected applicants do not concern the employment manager.

The vocational counselor, however, has to think of the ninety-five as well as the five. His field is a broad one. He is called upon to advise people possessing every variety of fitness to enter every possible kind of occupation. It would be manifestly impossible for the vocational counselor to give adequate trade or psychological tests corresponding to the infinite variety of occupations open to American youths.

It is true that he must avail himself of every possible scientific aid in arriving at his conclusions. His preparation will necessarily include a wide knowledge of occupations, and special training in the discovery of occupational aptitudes. But he should never persuade himself or lead others to believe that he is able to chart unerringly their abilities and give them an absolute vocational classification. The successful counselor will understand at the outset that he is a guide and not a dictator, and that he is dealing with probabilities and not with certainties.[2]

Occupational Levels of Intelligence

Among the factors which the counselor must take into account in estimating the probability of a person's success in an occupation, the intelligence level is one of the most important. If we accept Stern's definition of intelligence as a working basis for the discussion of the subject, there can be no question of the vital connection between intelligence and vocational success. Stern says:[3] "Intelligence is a general capacity of an individual consciously to adjust his thinking to new requirements: it is general mental adaptability to new problems and conditions of life." Given a high degree "of mental adaptability to new problems and conditions of life" coupled with energy, persistence, and reliabil-

[2] Kitson, H. D. "Vocational guidance and the theory of probability," *School Review*, 28:143-50, February, 1920.

[3] Stern, William. *The psychological methods of testing intelligence.* Baltimore, Warwick & York, 1914, p. 3.

ity, it would be reasonable to assume that one's range of possible vocational success would be wide. Conversely, given a low level of intelligence, even though the other qualities mentioned are present, one's range of possible vocational success would be greatly restricted.

We have already gone far enough in the development of intelligence tests to justify the statement that individual levels of intelligence can be discovered with approximate accuracy. The next step, so far as vocational guidance is concerned, is to discover whether or not there are occupational intelligence levels, i.e. levels of intelligence more or less characteristic of the workers in a given occupation. That there are discoverable differences in the intelligence levels of workers in the various occupations is suggested by the findings of the Division of Psychology, Sanitary Corps, United States Army.[4]

Table XIV is derived from the chart found on page 23 of the pamphlet, *Army Mental Tests*. The median ratings of this chart are changed from the letters "A," "B," etc., to the raw scores on the Alpha Army Scale (which range from 0 to 212). For each of the 43 occupations selected from the 72 shown on the chart, the median score is given, as well as the range of the middle 50 percent of the scores. The top line of the table would then read: laborers, median score, 35; range of scores made by the middle 50 percent, 21-63. It should then be understood that 25 percent of the laborers scored less than 21 points, while the top 25 percent scored over 63 points out of a possible 212 points. The chart was made up from the returns of approximately 36,500 men, and the data were taken from the soldiers' qualification cards.

Figure 4 illustrates graphically the spread of the middle 50 percent of the scores on Army Alpha by occupational groups. There is considerable overlapping. The unskilled, semi-skilled, and skilled labor groups differ but little as to the beginning of the middle 50 percent of scores (21, 23, and 26 respectively). But there is a distinct difference in the upper limits, which are

[4] *Army mental tests, methods, typical results, and practical applications.* Washington: Government Printing Office, November, 1918.

63, 70, and 95 respectively. The beginning of the middle 50 percent of the business and clerical group is nearly as high as the upper limit for the unskilled labor group, and the beginning of the middle 50 percent of the professional group is higher than the upper limit of the skilled labor group.

If the scores of the entire number of men examined by the Division of Psychology, Sanitary Corps, of the United States Army could be grouped by occupations the final results of compilation would probably show some deviations from the medians and middle 50 percents given in Table XIV. But the general tendencies therein indicated would no doubt be confirmed. There would be found more or less clearly defined levels of intelligence in the various occupations, corresponding roughly to the amount of intelligence necessary to succeed in them. There would be much overlapping and within each occupation a wide range of intelligence would be found. But in the occupational groups above unskilled labor one would expect to find critical scores[5] or points below which occupational success could not be expected.[6] In the professional group, for example, one would expect to find the greatest number of occupational failures among the lowest 25 percent, i.e., among those who made scores ranging from 0 to 98.

Application to Guidance of High-School Pupils

How a knowledge of individual and occupational intelligence levels may be utilized in the vocational guidance of high-school pupils can be illustrated by the data presented in Table XV. In this table 930 pupils in eight high schools are distributed according to vocational ambition and scores made on Army Scale Alpha and Examinations *a* and *b*. The different occupational choices have been divided into five groups: agriculture, mechanical and industrial, business and clerical, unclassified,[7] and professional.

[5] Thurstone, L. L. "Mental tests for college entrance," *Journal of Educational Psychology*, 10:129-41, March, 1919.

[6] Cowdery, K. M. "A statistical study of intelligence as a factor in vocational success," *Journal of Delinquency*, 4:227, November, 1919.

[7] Most of the occupations belonging to this group are called "professional" by the United States Census Bureau.

TABLE XIV. OCCUPATIONAL INTELLIGENCE LEVELS, BASED ON ARMY PSYCHOLOGICAL TESTS OF 36,500 MEN. ALPHA SCALE

Occupations	Median Score	Range of Middle 50 Percent
LABORERS (UNSKILLED)	35	21 to 63
SEMI-SKILLED LABOR		
Cobblers	39	23 to 67
Teamsters	41	23 to 68
Farm workers	42	24 to 70
Barbers	43	22 to 70
Horse-shoers	44	25 to 70
SKILLED LABOR		
R. R. shop-mechanics	45	26 to 83
Bricklayers	48	23 to 81
Cooks	49	28 to 79
Bakers	53	35 to 83
Painters	53	31 to 79
Blacksmiths	54	29 to 83
Bridge-carpenters	55	27 to 84
General carpenters	57	33 to 85
Butchers	58	33 to 85
Locomotive enginemen	59	33 to 82
Machinists	61	33 to 86
R. R. conductors	62	40 to 84
Plumbers	62	38 to 87
Tool-makers	63	41 to 88
Auto-repairmen	63	41 to 89
Chauffeurs	63	38 to 90
Tool-room-experts	64	43 to 88
Policemen-detectives	64	44 to 89
Auto-assemblers	65	44 to 97
Ship-carpenters	66	49 to 95
BUSINESS AND CLERICAL		
Telephone operators	70	58 to 99
Concrete const'n foremen	75	48 to 116
Photographer	77	52 to 104
General electrician	82	58 to 110
Telegraphers	84	59 to 107
R. R. clerks	92	66 to 116
General clerks	96	74 to 123
Mechanical engineers	98	63 to 133
Bookkeepers	99	78 to 126
Dental officers	106	84 to 130
Mechanical draughtsmen	112	79 to 134
Stenographers	115	93 to 142
Accountants	117	101 to 145
PROFESSIONAL		
Civil engineers	125	98 to 147
Medical officers	130	101 to 165
Army chaplains	150	109 to 173
Engineer officers	157	134 to 184

The professional group covers 50.5 percent of the choices, 470 cases; unclassified, 11.2 percent, 104 cases; business and clerical,

Approximate occupational intelligence levels:

1. Unskilled labor	Median	35,	Middle	50%	21	to	63
2. Semi-skilled	,,	42,	,,	,,	23	to	70
3. Skilled labor	,,	61,	,,	,,	26	to	95
4. Business and clerical	,,	96,	,,	,,	58	to	145
5. Professional	,,	140,	,,	,,	98	to	184

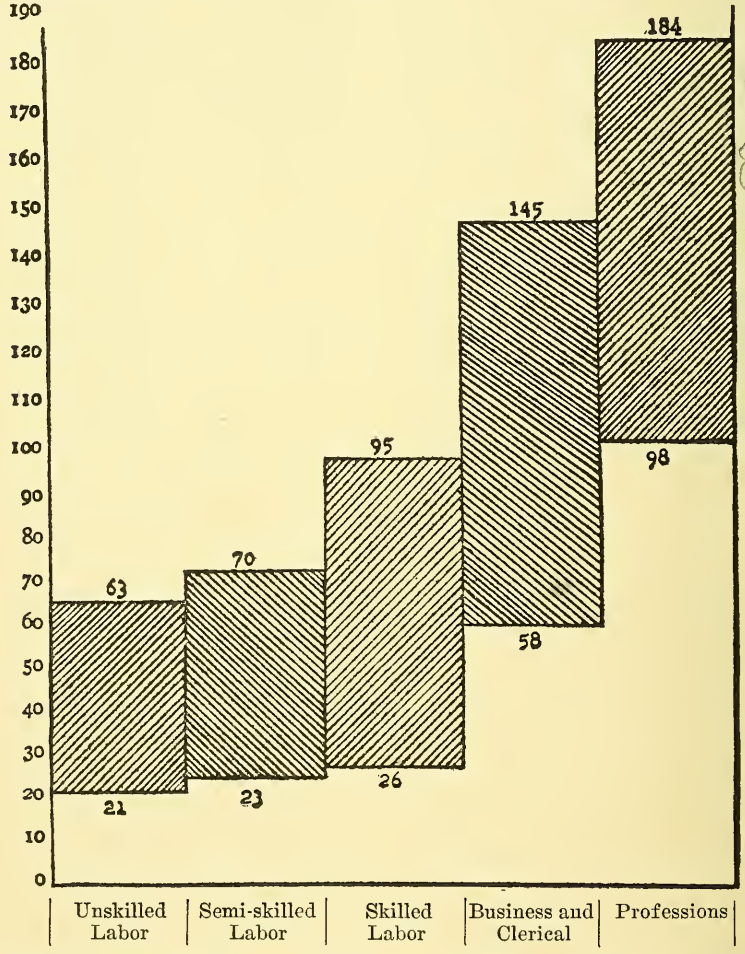


FIGURE 4. SHOWING SPREAD OF MIDDLE 50 PERCENT OF CASES, TABLE XIV, BY OCCUPATIONS

TABLE XV. VOCATIONAL AMBITIONS OF 930 HIGH-SCHOOL PUPILS DISTRIBUTED ACCORDING TO INTELLIGENCE RATINGS ON ARMY SCALE ALPHA AND GROUP EXAMINATIONS *a* AND *b*

Letter rating	C—	C		C+		B		A	Total	
Alpha.....	25–44	45–59	60–74	75–89	90–104	105–119	120–134	135–212		
a and *b*.....	25–49	50–67	68–84	85–99	100–119	120–137	138–154	155–237		
Choice of Occupation										
AGRICULTURE										
Agriculture.....	.....	2	1	5	4	7	10	12	41	
Floriculture.....	.....	.....	.....	.....	1	.....	.....	.....	1	
Forestry.....	.....	.....	1	.....	.....	1	.....	2	4	46
MECHANICAL AND INDUSTRIAL										
Auto-mechanic...	.....	.....	.....	.....	4	.....	.....	.....	4	
Dressmaker.....	.....	.....	.....	.....	.....	2	.....	.....	2	
Draughtsman.....	.....	.....	2	5	.....	3	8	3	21	
Electrician.....	.....	.....	.....	.....	.....	1	.....	.....	1	
Contractor.....	.....	.....	.....	.....	1	.....	.....	.....	1	
Milliner.....	.....	.....	.....	.....	1	.....	.....	.....	1	
Printer.....	.....	.....	.....	.....	.....	1	1	.....	2	
Aviator.....	.....	.....	.....	.....	1	.....	1	.....	2	34
BUSINESS AND CLERICAL										
Banker.....	.....	.....	.....	1	.....	.....	.....	1	2	
Bookkeeper	.....	3	5	10	22	9	7	6	62	
Business manager.	.....	1	2	6	5	3	1	5	23	
Civil Service.....	.....	.....	.....	.....	.....	.....	1	.....	1	
Clerk (sales).....	.....	.....	1	1	.....	1	.....	.....	3	
Manufacturer....	.....	.....	.....	.....	1	1	.....	.....	2	
Real estate.....	.....	.....	.....	1	.....	1	.....	1	3	
Salesman (Tr)....	.....	.....	.....	.....	2	1	1	.....	4	
Stenographer.....	2	2	11	24	41	38	33	25	176	276
UNCLASSIFIED										
Actress.....	.....	.....	.....	2	1	1	.....	.....	4	
Army and Navy..	.....	.....	.....	.....	3	3	2	6	14	
Artistic career....	.....	.....	2	2	10	5	6	3	28	
Dancer.....	.....	.....	.....	.....	.....	.....	1	.....	1	
Dog Fancier.....	.....	.....	.....	.....	1	.....	.....	.....	1	
Home-maker.....	.....	.....	1	.....	1	1	1	1	5	
Nurse.....	.....	.....	4	7	10	11	8	6	46	
Sea-captain.....	.....	.....	.....	.....	1	.....	.....	.....	1	
Social Service.....	.....	.....	.....	.....	.....	1	.....	1	2	
Writer.....	.....	.....	.....	.....	.....	.....	1	1	2	104
PROFESSIONAL										
Architect.....	.....	.....	.....	.....	.....	3	.....	.....	3	
Bacteriologist....	.....	.....	.....	.....	.....	.....	1	1	2	
Chemist.....	.....	.....	.....	1	.....	3	3	7	14	
Dentist.....	.....	1	.....	2	3	1	2	2	11	
Druggist.....	.....	.....	.....	.....	.....	2	.....	3	5	
Engineering.....	.....	.....	2	12	20	30	32	44	140	
Journalism.....	.....	.....	.....	.....	2	3	.....	5	10	
Law.....	.....	.....	.....	.....	2	2	9	7	20	
Librarian.....	.....	.....	.....	.....	.....	1	2	2	5	
Ministry.....	.....	.....	.....	.....	.....	.....	1	.....	1	
Physician.....	.....	.....	.....	1	4	11	10	10	36	
Teaching.....	.....	.....	8	23	44	68	47	33	223	470
Totals.....	2	9	40	103	185	215	189	187	930	

29.7 percent, 276 cases; mechanical and industrial, 3.6 percent, 34 cases; and agricultural, 5.0 percent, 46 cases.

The need for vocational guidance of high-school pupils is brought out very clearly by the way in which the choices are con-

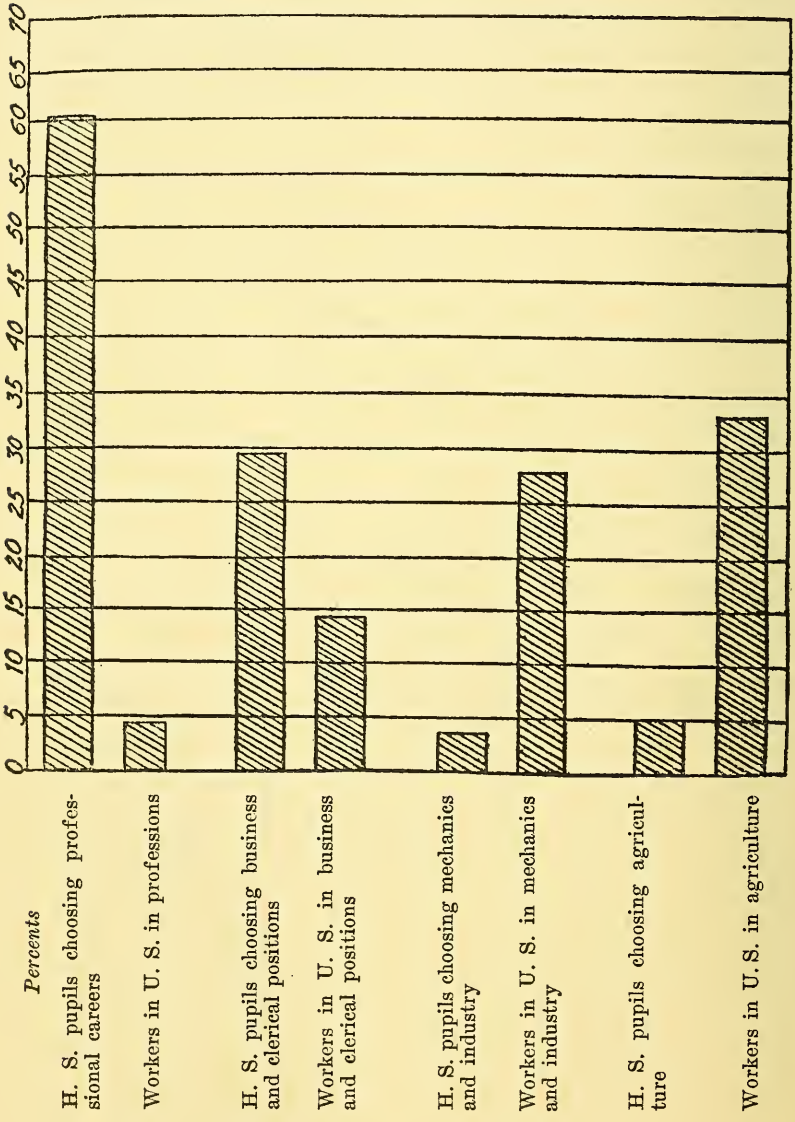


FIGURE 5. COMPARISON OF OPPORTUNITIES WITH VOCATIONAL AMBITIONS

centrated in the professional, semi-professional (i.e. unclassified), and business and clerical divisions of Table XV. These include 31 different occupations, popularly known as "white collar jobs," and comprise 91.2 percent of the 930 choices. Agricultural, mechanical and industrial occupations include 11 different employments, and 8.8 percent of the choices. See Figure 5.

Vocational opportunities, as shown by the United States census reports,[8] are just about the reverse of the distribution of high-school pupils' occupational choices. Agriculture and the mechanical and industrial arts engage the energies of 61.1 percent of the gainful workers in the United States, and only 8.8 percent of the high-school pupils had ambitions looking toward these fields. Business and clerical employments enlist only 14.1 percent of the gainful workers of the country; and yet 29.7 percent of the high-school pupils plan to enter these fields of effort. In the United States census reports practically all of the occupations designated in Table XV as unclassified are included under the caption "professional service." In spite of this liberal interpretation of the term "professional" only 4.4 percent of the gainful workers are found to be engaged in professional service in this country. Nevertheless the professional and unclassified divisions of Table XV include 574 choices, or 61.7 percent of the total number.

Although it is a fact that the high school represents a rather highly selected group of young people from whose ranks the clerical, business, and professional occupations are very largely recruited, it is apparent that by no means 91.2 percent of high-school pupils will ultimately find their way into these occupational fields.[9] Furthermore for their own best good and the best good of the nation a great many of them should be directed toward the agricultural, mechanical, and industrial fields.

The question may be raised as to the use that a vocational counselor might make of facts regarding the intelligence of high-

[8] *Thirteenth census of the United States, 1910. Volume 4: population: occupation statistics.* Washington: Government Printing Office, 1914, p. 40.

[9] See Table XIX (a) and (b), p. 82.

school pupils such as are shown in Table XV. Assuming that occupational levels approximating those found in Table XIV have been established, the counselor could proceed on the theory that those falling within the lowest quarter of intelligence ratings, i. e., who make scores lower than the beginning score for the middle 50 percent of a given occupation, would probably have small chances of success as workers in that occupation.

Take the professional group. The intelligence-score limits of the middle 50 percent as shown in Table XIV are from 98 to 184 (Alpha). There are fifty cases in the professional group, Table XV, who made an intelligence score of less than 90 points on the Alpha Scale. The counselor could safely consider the cases falling in this quarter of the professional group as doubtful. If teachers' estimates of intelligence and school marks confirmed the findings of the mental tests, he would be justified in making an effort to direct the thoughts of those boys and girls toward some other life career.

Specific occupations treated in the manner just outlined for the entire professional group would yield the following percents of doubtful cases: draughtsmen, 23.8 percent; bookkeepers, 21 percent; stenographers, 22.1 percent; dentists, 18.1 percent; engineers, 24.3 percent; lawyers, 15 percent; doctors, 13.9 percent; and teachers, 33.6 percent.

If by making use of intelligence ratings of individual pupils in connection with the intelligence levels of the occupations which they are ambitious to enter the vocational counselor can give them more accurate advice as to the life career in which they are most apt to succeed he should by all means make use of such ratings. But it will probably be pointed out that intelligence ratings are not in themselves sufficiently reliable to justify their use in vocational guidance. To this objection it may be replied that the high-school counselor has at hand means of verifying the results of the mental tests. He is able to secure the estimates of teachers and others who know the pupils and he has access to the record of their success in school tasks. Agreement between teachers' estimates of intelligence and mental tests, or

TABLE XVI. DISTRIBUTION OF 930 HIGH-SCHOOL PUPILS ACCORDING TO INTELLIGENCE, SCHOOL MARKS, SEX, AND VOCATIONAL CHOICE

Rank of Vocational Ambition	Marks Below Average						Marks Average						Marks Above Average								
	1 I. Q. Below Average		*2* I. Q. Average		*3* I. Q. Above Average		*4* I. Q. Below Average		*5* I. Q. Average		*6* I. Q. Above Average		*7* I. Q. Below Average		*8* I. Q. Average		*9* I. Q. Above Average		*10* Totals		
	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	All
I	7	0	13	4	17	3	7	4	18	3	15	3	4	8	32	25	76	36	189	86	275
II	7	11	29	18	4	7	4	14	10	34	16	4	5	14	27	84	38	51	140	237	377
III	6	20	14	26	5	0	3	11	15	30	13	4	7	19	18	53	9	25	90	188	278
IV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	20	31	56	48	26	10	14	29	43	67	44	11	16	41	77	162	123	112	419	511	930

agreement between school marks and mental tests, would greatly strengthen the presumption that the tests had succeeded in discovering the pupil's mental level.

Discovery of Agreement Between Mental Tests, School Marks, and Vocational Ambition

The cases of the high-school pupils whose mental ratings and vocational ambitions are set forth in Table XV are redistributed in Table XVI in accordance with standing in school subjects, intelligence tests, and rank of vocational ambition. For the purposes of the three-way distribution, vocational ambitions are ranked as follows: Rank I: higher professional and executive positions; Rank II: business, semi-professional, higher clerical positions; Rank III: general clerical, skilled labor, etc.; Rank IV: semi-skilled labor; Rank V: unskilled labor.

Mental age equivalents for the Army Scale ratings were worked out by Dr. Samuel C. Kohs and the writer,[10] and from them intelligence quotients (I.Q.'s) were computed. The mental level of a child is more nearly represented by the I.Q. than by the raw scores on an absolute point scale because the latter take no account of the chronological age.

Sex differences in rank of vocational ambition are indicated in column 10. There are 189 boys, or 45.1 percent of the total number of boys, but only 86 girls, or 16.8 percent of the girls, who chose vocations of the first rank. The vocational ambitions of 33.4 percent of the boys and 46.3 percent of the girls are represented by Rank II, and those of 21.5 percent of the boys and 36.9 percent of the girls by Rank III. There were none of the 930 who chose vocations of less than Rank III. The most numerous choices of the boys were for the engineering profession and of the girls for stenography and teaching.

How those whose ambitions come in the different ranks would probably measure up in mental ability to the demands of the occupations chosen can be estimated by reference to the nine pos-

[10] See Appendix, p. 117.

sible combinations of I.Q. and school marks. Entries in column 1 show those who have I.Q.'s and school marks both below average. There are 51 pupils in this group. Seven of them have chosen occupations of Rank I, and 18 of Rank II. Since school marks confirm indications of mental tests as to low mental level in these cases the success of these pupils in occupations of Ranks I or II would be open to question.

In column 7 there are 57 cases, 16 boys and 41 girls, having marks above average and I.Q.'s below average. Here is an indication that the tests did not register the full ability of the pupils, or that they possess qualities of persistence and other attributes tending to supplement intelligence as factors in successful school work.

Columns 2 and 3 indicate that there are many pupils whose intelligence is average or above average but who do poor school work. Teachers are apt to rate such pupils low in intelligence. The mental tests give the counselor an insight into their true ability and enable him to employ methods of waking them up through the discovery of the right life-career motive.

The cases entered in columns 6 or 9 where the I.Q.'s are above average and school success is average or above average can be considered as satisfactory, so far as intelligence is concerned, for the occupations chosen. However, the counselor can be of great service to the pupils in these groups through his ability to give information as to the demand for workers, the opportunities for advancement, the qualifications as to health, temperament, training, etc., expected of those who enter the occupations selected for consideration.

There is no purpose here to suggest that a counselor should always advise those who have superior ability to enter high ranking occupations. If a bright boy or girl would be more contented in an occupation ranking low on the rating scale, there is no occation to urge him or her to select another simply because it ranks higher in popular estimation. There is room for superior intelligence in every occupation, and it would be well for the country if young people of superior ability were encouraged to follow agri-

cultural, mechanical, and industrial pursuits, in order that they might become leaders therein. The professions are overcrowded, but there is always room for young people with ideas and energy in the food producing and industrially creative occupations.

Summary and Conclusions

1. The use of psychological and trade tests in the selection of employees can be more easily shown to be effective than can the use of such tests in vocational guidance. The employment manager can "play safe" by rejecting all but the most promising applicants, while the vocational counselor must needs endeavor to give sound advice to all comers.

2. Minute charting of abilities by means of psychological and trade tests is not practicable at the present time for the public school vocational counselor. There are far too many different occupations and the specific abilities of individual pupils are much too various to permit of accurate "pigeon-holing" according to manual, conceptual, and other types. Likewise a given combination of abilities might mean successful participation in any one of a wide range of occupations.

3. The discovery of the levels of intelligence of individuals and of occupational groups may prove to be of great assistance to the high-school counselor. The data on army mental tests, arranged in Table XIV, indicate that there are rather definitely marked occupational levels of intelligence. The norms already suggested would probably be confirmed by a compilation of all available data.

4. Application of the Army Intelligence Scale to 930 high-school pupils and the distribution of the cases according to intelligence rating and vocational ambitions is shown in Table XV. Illustration is also given of the way in which this knowledge might be applied to the vocational guidance of the group tested.

5. Need of vocational guidance of high-school pupils is shown by the fact that the concentration of choices in the professional, business, and clerical occupations is out of all proportion to the opportunities in those lines as shown by the United

States census. The demands for workers in agricultural, industrial, and mechanical pursuits should be emphasized by the counselor.

6. The need for supplementary information to verify the findings of the intelligence tests is shown in Table XVI. The 930 cases are distributed according to sex, school marks, vocational ambition, and intelligence. Where intelligence rating and school marks agree the presumption is that the intelligence level was approximated by the mental test. Where they do not agree it is a warning to make further inquiry into the matter.

7. The employment of psychological tests as an aid in vocational guidance is in the early experimental stage, but sufficient progress has been made to justify their use in a negative way, i. e., as a means of discovering to the counselor the kinds of occupations that a given high-school pupil would probably better avoid. They are useful also as a means of satisfying a counselor that a given pupil has the mental ability to engage in the occupation which he has chosen, providing other necessary factors conditioning success are present. In any case the counselor will do well to remember that he is dealing with probabilities and not with certainties. The mental tests, if conservatively employed, will increase the probability that the counselor will give really helpful advice.

CHAPTER VI

RELATION OF GENERAL INTELLIGENCE TO THE PERSISTENCE OF EDUCATIONAL AND VOCATIONAL PLANS OF HIGH-SCHOOL PUPILS

The question is frequently raised as to the value of data concerning the present ambitions of high-school pupils. The claim is made that the answers to questions regarding vocational and educational plans are unreliable either because the pupil has no definite ideas regarding his life work or because he does not take the question seriously. It is therefore of genuine interest to all who attempt the advisement of youth to know whether and to what extent the vocational ambitions and educational plans of boys and girls in the high school represent significant and abiding life interests.

This chapter will treat the data gathered in a fourth-year follow-up of the groups of high-school pupils whose vocational ambitions, educational plans, school success, and general intelligence scores on the group scales, Army Alpha and Examinations *a* and *b*, were secured during the academic year 1917-18. The results of the first check-up, made two years after the original data were obtained, are set forth in Chapters II, III, and V of this monograph. In the chapters just mentioned mental tests were discussed from the viewpoint of their adaptability in the educational and vocational guidance of high-school pupils. The fourth year follow-up presents the situation as it appeared in the year 1921-22, and furnishes the basis for tentative deductions in regard to the persistence of educational and vocational plans announced by high-school pupils.

Only those pupils who attended the Palo Alto, San Mateo, Redwood City, Mountain View, and Santa Clara high schools are considered in the study presented in this chapter. It was found to be difficult to secure information concerning cases from the other high schools which were included in the original investigation. An additional item in favor of confining the fourth-

year check-up to the five high schools we have named was the fact that there had not been a change in administrative head in any of these high schools during the four-year period.

In these high schools 771 pupils had originally filled out the questionnaires in full and had taken the mental tests. Some 88 of these could not be located, leaving 683 concerning whom reliable information could be had. The 683 cases were distributed as follows: (a) in occupations, 272; (b) in educational institutions beyond the high school, 290; (c) still in the high school, 33; (d) married, 47; (e) just graduated, plans indefinite, 27; (f) prevented from carrying out plans by ill health, 10; (g) died, 4.

The mental age and I.Q. values hereafter referred to are those found in the original examination. No new tests were given. The Army Alpha scale was the group test employed, and the mental-age equivalents were derived from the Kohs-Proctor mental-age norms for the Alpha scale.[1]

Persistence of Vocational Plans of Cases Now in Occupations

Table XVII gives the distribution of the 272 cases found to be engaged in occupations, according to their intelligence levels and also as to the relation of the present occupation to the vocational preference expressed four years ago. Sex differences are indicated under the captions "B" and "G." Wherever in this and in subsequent tables the rank of vocations is referred to it is to be understood that occupations are ranked from I to V as follows: Rank I, higher professional and executive positions; Rank II, semi-professional, managerial, and higher commercial positions; Rank III, general clerical and commercial positions, skilled labor, etc.; Rank IV, semi-skilled labor; Rank V, unskilled labor.[2]

When the data of Table XVII are summarized and expressed in the form of percents, the meaning of the table becomes more

[1] See Appendix, p. 117.
[2] See Barr Scale, Appendix III, p. 122.

TABLE XVII. RELATION OF OCCUPATION IN 1921-22 TO PREFERENCE IN 1917-18

	General Intelligence—I. Q. (Alpha)						Totals		
	80–99		100–119		120 or over				
	B	G	B	G	B	G	B	G	Both
Vocation same as preference stated in 1917-18	3	28	14	34	3	5	20	67	87
Different vocation but of same rank as original preference	1	7	4	5	1	1	6	13	19
Higher rank	0	0	0	0	0	2	0	2	2
Lower rank	39	31	46	31	15	2	100	64	164
Totals	43	66	64	70	19	10	126	146	272

evident. Forty percent of these former high-school pupils are engaged in occupations of the same or higher rank with reference to their original vocational preference. Correspondingly, 60 percent are in occupations of lower rank than that of the preference expressed in 1917-18. The sex differences are quite marked, especially when taken in connection with the intelligence levels. For example, among the boys, 9 percent of those with I.Q.'s below 100 and 30 percent of those with I.Q.'s above 100 are engaged in occupations equal to or above their preference. On the other hand, among the girls, those above average intelligence have been no more successful than those of less than average intelligence in attaining their objectives. The percents are 51 for the former and 53 for the latter. In other words, intelligence appears to have played a greater part in the case of the boys than it did in the case of the girls.

The sex differences brought out in the preceding paragraph are accounted for in part by the fact that in the original survey the vocational ambitions of the boys ranked higher than those of the girls. This point will be further discussed in connection with Table XVIII.

As has already been shown in connection with Table XVII, the percent of girls with I.Q.'s below 100 who were in occupations of their choice or in occupations of higher rank was 53, while the percent of boys in the same situation was only 9. In Table

TABLE XVIII (a) THE ORIGINAL VOCATIONAL PREFERENCES AS EXPRESSED IN 1917-18

Rank of Occupations Preferred	General Intelligence—I. Q.						Totals		
	80–99		100–119		120 or over				
	B	G	B	G	B	G	B	G	Both
I	13	2	22	4	13	0	48	6	54
II	11	23	20	35	3	5	34	63	97
III	19	41	22	31	2	5	43	77	120
IV	0	0	0	0	1	0	1	0	1
V	0	0	0	0	0	0	0	0	0
Totals.....	43	66	64	70	19	10	126	146	272

(b) OCCUPATIONS ENGAGED IN FOUR YEARS LATER (1921-22)

Rank of Present Occupation	General Intelligence—I. Q.						Totals		
	80–99		100–119		120 or over				
	B	G	B	G	B	G	B	G	Both
I	0	0	0	0	0	0	0	0	0
II	2	3	4	5	3	3	9	11	20
III	14	50	22	50	4	7	40	107	147
IV	15	13	30	15	11	0	56	28	84
V	12	0	8	0	1	0	21	0	21
Totals.....	43	66	64	70	19	10	126	146	272

XIX (a), however, it appears that in 1917-18 56 percent of the boys and 38 percent of the girls with I.Q.'s from 80-99 had vocational preferences that ranked above III, while in 1921-22, 63 percent of the boys and 20 percent of the girls in that intelligence group, Table XIX (b), were in occupations ranking IV and V. In 1917-18 the median vocational preference of the boys was

Rank II; of the girls Rank III. In 1921-22, the median occupations of the boys was Rank IV; of the girls Rank III.

When we consider the group with I.Q.'s of 100 or over, we note that whereas about 70 percent of the boys and 55 percent of the girls had ambitions ranking I and II, none of either sex was found in occupations ranking I, and only 9 percent in occupations ranking II. In 1917-18, none of the girls and only 1.2

TABLE XIX. PERCENTAGE SUMMARY OF TABLE XVIII. (a) ORIGINAL VOCATIONAL PREFERENCES EXPRESSED IN 1917-18

Rank of Occupations Preferred	General Intelligence—I. Q.						Totals		
	80–99			100 or over					
	B	G	Both	B	G	Both	B	G	Both
I	30.5	3.0	16.0	42.1	5.0	24.0	38.0	4.0	20.0
II	25.5	35.0	31.0	27.7	50.0	39.0	27.2	43.0	35.6
III	44.0	62.0	53.0	29.0	45.0	37.0	34.0	53.0	44.0
IV	0	0	0	1.2	0	0	0.8	0	0.4
V	0	0	0	0	0	0	0	0	0

(b) OCCUPATIONS ENGAGED IN WHEN CHECKED UP IN 1921-22

Rank of Occupation now Engaged in	General Intelligence—I. Q.						Totals		
	80–99			100 or over					
	B	G	Both	B	G	Both	B	G	Both
I	0	0	0	0	0	0	0	0	0
II	4.5	4.5	4.5	8.4	10.0	9.0	7.0	8.0	7.0
III	32.5	75.5	58.8	31.4	71.0	51.0	32.0	73.0	54.0
IV	35.0	20.0	25.7	49.2	19.0	34.0	44.0	19.0	31.0
V	28.0	0	11.0	11.0	0	6.0	17.0	0	8.0

percent of the boys had ambitions ranking IV or V, but in 1921-22, we find about half the boys in occupations ranking IV, and 11 percent in occupations ranking V. We find none of the girls of this I.Q. group in occupations ranking V, but 19 percent of them are found in occupations ranking IV.

The influence of intelligence on persistence in vocational plans is apparently discoverable, but at this stage of the investigation it has not yet become pronounced. Our data permit a few pertinent statements. According to section (b) of Table XIX, 9 percent of those of better than average intelligence are in occupations ranking II, while only 4.5 percent of those of less than average intelligence are in occupations of that rank. Again, 28 percent of the boys with below average intelligence are in occupations ranking V, while only 11 percent of the boys with above average intelligence are in this lowest class of occupations. In the case of the boys, it has already been stated in connection with Table XVII that those of better than average intelligence showed greater persistence in the occupations of their original choice. The figures were 30 percent for those with I.Q.'s of 100 or higher and 9 percent for those with I.Q.'s below 100.

A check-up made four years after the original survey could hardly be expected to reveal pronounced correlations between intelligence and persistence in vocational plans, but it is significant that there seems to be a tendency for those of below average ability to gravitate toward occupations ranking IV and V. A similar check-up, made four years hence, will probably reveal a much more pronounced tendency for those of above average ability to be found in the higher ranking occupations than is now the case. With reference especially to boys, it is well known that they have to start at the bottom in a given occupation or that they may even have to take some temporary job which has no relation to their vocational preference.

The data here presented at least lends support to the supposition that those of better than average ability will tend gradually to approximate their vocational ambitions, while those with below average ability will be more apt to find their ultimate occupations at levels below their high-school plans for a life career. Two concrete cases will illustrate this point. A certain boy whose I.Q. was 92 expressed vocational preference, "Doctor of Medicine." He is now driving a delivery wagon. Another whose ambition was that of "Electrical Engineer," had an I.Q.

of 89. He left the high school because of failure in his work, and is now working at odd jobs as a day laborer.

Illustrating the tendency of those with above average ability to climb to higher occupational levels, are the two cases in Table XVII of girls who are following vocations of higher rank than their vocational preference. One, I. Q. 129, whose ambition was to be a stenographer, is now a teacher; the other, I.Q. 130, who was also ambitious to be a stenographer, started her work in that vocation, and is now a successful office manager.

Relation of Intelligence to Training before Entering Occupations

Table XX distributes the 272 persons engaged in occupations in relation to their intelligence and also in relation to the specific training which they had for the occupation which they entered.

TABLE XX. RELATION BETWEEN INTELLIGENCE AND OCCUPATIONAL TRAINING

Training for the Occupation before Entering it	Intelligence Ratings—I. Q.									Totals		
	80–99			100–119			120 or over					
	B	G	Both	B	G	Both	B	G	Both	B	G	Both
Some in High School or Later												
Number	9	24	33	9	18	27	8	3	11	26	45	71
Percent	21	36	30	14	26	20	42	30	38	21	31	26
None in High School or Later												
Number	34	42	76	55	52	107	11	7	18	100	101	201
Percent	79	64	70	86	74	80	58	70	62	79	69	74
Total	43	66	109	64	70	134	19	10	29	126	146	272

The girls evidently had more training for their occupations than the boys. This is expressed by the percent of 31 for the girls and 21 for the boys. Moreover, as has already been shown, a higher percent of girls than of boys tended to persist in their vocational ambitions. The character of the vocational ambitions of the girls may account for these facts. By far the greater number of girls were ambitious to fill clerical positions and

either took commercial subjects in the high school or attended a business college after graduation and before securing a position.

No unmistakable relation between intelligence and occupational training is apparent. On the one hand, more of the group of less than average intelligence had taken such training than was true of the average group. On the other hand, more of the superior group had occupational training than was the case with either of the other two groups. Differences, however, as revealed by the percents of Table XX are not large enough to be especially significant.

The real point of interest in this table is the fact that only 71 out of 272 of these former high-school pupils, or 26 percent of them, had any training either in the high school or after leaving the high school for the occupations in which they are now engaged. In other words, approximately three out of every four of them had not had any preparation whatever for their vocation. Either there was no vocational guidance worth mentioning in connection with these five high schools, or the provision for vocational instruction was very meager. The truth is that both counts of the indictment can be established beyond a reasonable doubt. These five high schools are under the shadow of Stanford University, and none of them is more than fifty miles from the University of California. Their location has caused them to stress college entrance to the neglect of vocational education. It is not, therefore, surprising that 74 percent of those who entered occupations after attending these high schools were compelled to do so without any specific preparation.

Relation between Intelligence and Persistence in Educational Plans

The reader will recall that 290 of the students on whom, after the four-year period, the data were secured were still attending some educational institution. In order to compare their plans as expressed in 1917-18 with their realization of them in 1921-22, an arbitrary rating of the educational institutions they were attending was applied. Thus a college or university was

rated higher than a normal school, a normal school higher than a business college, etc. Table XXI shows the relation between the intelligence of these students and the rank of the institutions they were attending in 1921-22.

In contrast with the showing of Table XVII, where it was found that only 40 percent of those who entered occupations were employed in the occupation of their original choice, Table XXI indicates that 81 percent of those who continued their education

TABLE XXI. DISTRIBUTION OF 290 PUPILS ACCORDING TO INTELLIGENCE AND PERSISTENCE IN EDUCATIONAL PLANS

	General Intelligence—I. Q.									Totals		
	80–99			100–119			120 or over					
	B	G	Both	B	G	Both	B	G	Both	B	G	Both
Pupils Following Educational Plans the Same as, Equal to, or Superior to Original Plans												
Number	9	21	30	57	70	127	53	25	78	119	116	235
Percent	64	62	63	85	86	81	98	83	93	89	75	81
Pupils Following Educational Plans of Lower than Original Rank												
Number	5	13	18	10	21	31	1	5	6	16	39	55
Percent	36	38	37	15	14	19	2	17	7	11	25	19
Totals	14	34	48	67	91	158	54	30	84	135	155	290

beyond the high school are carrying out plans the same as, equal to, or superior to their original plans for an education. Also it appears from Table XXI that 89 percent of the boys and only 75 percent of the girls are following the same or higher educational plans, whereas of those in occupations only 26 percent of the boys and 56 percent of the girls were carrying out their original intentions.

The difference in persistence of educational plans between the boys and girls is due in a measure to the fact that most of the boys have ambitions leading to professional occupations that require a college education, while a considerable number of girls who originally planned to go to college decided, after

graduation from the high school, to teach and are now attending normal schools.

There is a more clearly marked relationship between intelligence and persistence in educational plans than there is between intelligence and persistence in vocational plans. There is a decided rise in the percent of boys and girls following the same or higher educational plans as the average of intelligence increases. In the lowest intelligence group, 63 percent; in the medium group, 81 percent; and in the highest group, 93 percent have persisted in the same or better plans for their education.

TABLE XXII. INTELLIGENCE OF THOSE IN OCCUPATIONS AND IN EDUCATIONAL INSTITUTIONS

	General Intelligence—I.Q.					
	80–99		100–119		120 or over	
	Number	Percent	Number	Percent	Number	Percent
Group now in educational institutions ..	48	16	158	55	84	29
Group now in occupations.....	109	40	134	49	29	11

There appears to be a clear-cut difference in intelligence between the pupils now in occupations and those in educational institutions beyond the high school. This fact is shown in general by the median intelligence quotients of the two groups. For those in educational institutions it is 115, and for those in occupations it is 105. The condition is exhibited in greater detail in Table XXII.

In this table the reader's attention is particularly called to the fact that among the pupils now in educational institutions, only 16 percent have intelligence quotients below 100; while on the other hand of the pupils now in occupations, 40 percent have intelligence quotients below 100. At the high end of the range of intelligence the preponderance is reversed. In other words, a much greater proportion of those in educational insti-

tutions have intelligence quotients of 120 or over than is the case with those now in occupations.

Another distribution of the group in occupations—a distribution which is not here reproduced in tabular form—brought out the general fact that those who left the high school to go to work before graduation had a median intelligence quotient of 95, while those who completed the high school before going to work had a median intelligence quotient of 111. Observe also that the intelligence of those who left school to go to work is 20 points below that of the group in educational institutions.

There is likewise considerable difference between those who are still pursuing their education and those who are now em-

TABLE XXIII. VOCATIONAL AMBITIONS OF THOSE IN OCCUPATIONS AND IN EDUCATIONAL INSTITUTIONS

	Rank IV		Rank III		Rank II		Rank I	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Group in educational institutions.....	0	0.0	32.	11.0	152.	52.0	106.	37.0
Group in occupations	1	0.4	120.	44.0	97.	35.6	54.	20.0

ployed in respect to the vocational ambitions which they had four years ago. Table XXIII gives the details. Although only one person in the occupations group expressed a preference for occupations of Rank IV or V, it will be seen that 44 percent of those in this group were content with Rank III, while only 11 percent of those in educational institutions looked forward to similar vocations. The preponderance of choice for Rank I among the pupils who continued their education is also worthy of note (37 percent as compared with 20 percent).

Summary and Conclusions

1. This study represents a fourth-year follow-up on 771 high-school pupils who had been tested for general intelligence and who had answered questions regarding vocational and educational plans in 1917-18.

2. Of these, 272 were found in occupations and 290 in educational institutions beyond the high school.

3. Among those in occupations, 40 percent were employed at tasks ranking equal to or better than their ambitions while 60 percent were in occupations of lower rank. More girls than boys were following vocations of their original choice.

4. In the same group it was found that whereas in 1917-18, 99.6 percent had ambitions for occupations of Rank III or above, in 1921-22, 39 percent were actually found in occupations of Ranks IV and V.

5. The influence of intelligence on persistence in vocational plans was found to be noticeable but not pronounced.

6. Only 26 percent of the boys and girls in occupations had had any specific training either in the high school or after leaving it for the occupations in which they were engaged.

7. There appears to be a closer relation between intelligence and persistence in educational plans than between intelligence and persistence in vocational plans.

8. In terms of median intelligence quotients, those in educational institutions surpassed those in occupations by 10 points and were superior to those who left school to go to work by 20 points.

9. The vocational ambitions of those in educational institutions ranked higher than the vocational ambitions of those now in occupations. Of those in educational institutions 89 percent had ambitions ranking I and II while only 55 percent of those in occupations had equivalent ambitions.

10. The data presented in this study tend to support the theory that information regarding educational and vocational plans of high-school pupils while they are still in the high school has more significance than has heretofore been attached to it, and particularly that measurements of general intelligence may be of great value to the vocational and educational counselor in his work.

11. There is also an implied indictment of the high schools studied, in the fact that although 41 percent of the cases fol-

lowed up were found to have gone directly into occupations from the high school, only 71 out of the 272 had had any training in the high school for the tasks undertaken.

12. Better and more systematic educational and vocational guidance of high-school pupils, and more careful attention to those who will not go on to college, are needs that seem to be definitely indicated by the facts presented.

CHAPTER VII

PSYCHOLOGICAL TESTS AND COLLEGE ENTRANCE

Since the announcement by Columbia University that psychological tests had been adopted as an optional means of entrance to Columbia College for boys suitably recommended, there has been widespread experimentation with that method of testing fitness for college. Other universities, notably the University of Pennsylvania, the University of Chicago, the University of California, and Leland Stanford University now employ psychological tests as one of the conditions precedent to the admission of students of maturity who have not had full high-school preparation. A high score in a psychological examination is accepted as evidence of ability to undertake university work with profit.[1]

The standardization of mental tests that could be used by institutions adopting such a policy has been progressing rapidly within the past three years. Dr. E. L. Thorndike of Columbia University has developed and is perfecting his "Intelligence Examination for High School Graduates";[2] and Dr. L. M. Terman of Stanford University has published his mental test for high-school pupils.[3] The Otis Absolute Point Scale[4] and the Army Alpha Scale[5] have already been widely used for testing large groups of college and university students.

All first-year students at Stanford are now required to take the Thorndike College Entrance examinations, after admission. Dr. L. M. Terman is making a careful study of the college success of new entrants in relation to their scores on the Thorndike tests. Upon the results of this investigation will hinge the decision as to whether psychological tests shall be included among the present requirements for admission to the university.

Before abandoning the traditional entrance requirements, college and university authorities will want to be assured that, as a

[1] See Chapter VIII.
[2] See Appendix, p. 120.
[3] See Appendix, p. 119.
[4] See Appendix, p. 120.
[5] See Appendix, p. 119.

means of predicting possible success in college work, psychological tests have at least equal value with the record of the four years of preparatory work now required. The writer's contribution to this discussion will consist of the presentation of the data regarding 93 young people who were given the Alpha Army Test in 1917-18 while still in high school and who entered Stanford University after graduation from high school.

In Table XXIV the cases of these students are arranged in quarters according to rank in intelligence quotients.[6] Column 1 gives this rank order; column 2, the intelligence quotients; column 3, the high-school scholarship rating. (All high-school grades were given numerical values—1 for "A," 2 for "B," etc.—and averaged.) Columns 4 to 9 inclusive indicate the quarter hours of university marks earned by each student while at Stanford. Column 10 shows the total number of hours taken; column 11, the number of honor points; and column 12, the scholarship rating in university work.[7] The period of university work covered was that of the first three quarters (or that of the freshman year).

Relation of Rank in Intelligence to Scholarship in College

The summary of the 23 cases falling in the first quarter indicates that the median intelligence quotient was 127; that the median high-school scholarship was 1.9 (or a trifle better than B); and that as to ratings at the university 47 percent of the A's but only 7 percent of the failures, belonging to the entire 93 students, were allotted to the first quarter. In addition to this, 33 percent of the honor points came to the students in this quarter, and their average scholarship rating in university courses was 1.89.

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[6] All I.Q.'s are computed on the basis of the Kohs-Proctor mental age norms for the Alpha test. See Appendix, p. 117.

[7] This scholarship rating is secured by dividing the total number of registered hours into the honor points earned. Three honor points are given for a grade of "A"; two for a grade of "B"; one for a "C"; none for "D" or "E". The highest possible rating (all "A's") would be 3.00; the lowest (all "D's" or "E's") would be 0.0. A rating of "1.0" is average.

TABLE XXIV. RELATION BETWEEN RANK ORDER IN PSYCHOLOGICAL EXAMINATION AND SCHOLARSHIP IN HIGH SCHOOL AND UNIVERSITY (WORK OF THE FIRST THREE QUARTERS)

Rank According to I. Q.	I. Q.	H. S. Scholarship[a]	Number of Hours Indicated Grades at University						Total Hours	Honor Points	University Scholarship Rating[b]
			A	B	C	D	Cond.	Fail.			
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1	138	1.7	5	29	11	3	0	0	48	84	1.75
2	136	2.2	23	8	9	0	0	0	40	94	2.35
3	135	1.8	5	30	10	0	0	0	45	85	1.89
4	134	2.2	8	15	12	4	0	0	39	66	1.69
5	133	1.8	0	0	29	6	0	3	38	29	0.76
6	132	1.6	3	13	10	15	0	0	41	45	1.10
7	131	1.0	31	19	0	0	0	0	50	131	2.62
8	130	1.3	20	10	0	0	0	0	30	80	2.66
9	129	1.2	33	13	0	0	0	0	46	125	2.71
10	128	2.4	5	19	15	5	0	0	44	68	1.54
11	128	2.2	5	4	16	5	5	2	37	39	1.05
12	127	1.9	15	33	0	0	0	0	48	111	2.31
13	127	1.7	11	21	14	0	0	0	46	89	1.93
14	126	1.3	25	11	8	0	0	0	44	105	2.40
15	126	2.9	1	25	17	0	3	0	46	70	1.52
16	125	2.6	0	9	26	0	7	4	46	44	0.95
17	125	2.5	7	23	8	1	5	0	44	75	1.70
18	125	1.9	6	8	17	0	0	0	31	51	1.66
19	125	2.8	5	34	5	0	0	0	44	88	2.00
20	124	2.9	1	20	16	5	0	0	42	59	1.40
21	123	1.4	14	16	7	8	0	0	45	81	2.80
22	122	1.5	15	18	11	0	0	0	44	92	2.09
23	122	2.6	24	22	3	0	0	0	49	119	2.43
Totals,	First	Quarter	262	400	244	52	20	9	987	1,830	1.89[c]
24	122	1.8	5	11	19	11	0	0	46	56	1.22
25	121	1.3	17	6	2	0	0	0	25	65	2.60
26	121	2.2	14	22	8	0	0	0	44	99	2.25
27	120	1.1	28	14	0	0	0	0	42	112	2.57
28	120	1.1	6	29	5	5	0	0	45	81	1.80
29	120	2.8	2	23	17	0	5	0	47	69	1.47
30	120	2.7	0	15	20	0	5	5	45	50	1.10
31	119	1.7	5	8	14	8	5	5	45	45	1.00
32	118	2.4	0	15	19	4	3	1	42	49	1.16
33	118	1.0	8	35	4	0	0	0	47	98	2.08
34	118	1.5	12	25	0	0	0	0	37	86	2.32
35	117	2.4	8	8	29	1	0	0	46	69	1.50
36	117	2.0	0	25	13	5	0	0	43	63	1.46
37	116	2.1	0	18	22	0	0	0	40	58	1.45
38	116	2.1	0	28	11	5	0	0	44	67	1.52
39	116	2.5	5	0	0	0	5	5	15	15	1.00
40	116	1.7	10	21	8	3	0	0	42	80	1.90
41	116	2.4	3	12	18	10	0	4	47	51	1.08
42	115	1.9	20	17	7	0	0	0	44	101	2.29

TABLE XXIV (*Continued*)

Rank According to I. Q.	I. Q.	H. S. Scholarship[a]	Number of Hours Indicated Grades at University						Total Hours	Honor Points	University Scholarship Rating[b]
			A	B	C	D	Cond.	Fail.			
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
43	115	2.0	0	30	11	0	0	0	41	71	1.77
44	115	3.0	0	24	12	10	0	0	46	60	1.30
45	115	2.3	5	26	14	0	0	0	45	81	1.80
46	113	2.2	17	21	11	0	0	0	49	104	2.12
Totals,	Second	Quarter	165	433	264	62	23	20	967	1630	1.52[c]
47 (*Median*)[d]	113	2.7	10	7	23	8	0	0	48	67	1.40
48	113	3.0	0	6	15	0	0	8	29	27	0.93
49	112	2.1	6	9	24	4	0	0	43	60	1.40
50	112	2.0	0	6	8	10	8	12	44	20	0.45
51	112	2.6	0	19	16	5	0	5	45	54	1.20
52	111	3.2	9	18	9	10	0	0	46	72	1.56
53	111	3.0	0	8	27	8	0	0	43	43	1.00
54	111	3.0	0	0	2	0	0	9	11	2	0.18
55	110	1.8	10	28	5	0	0	0	43	91	2.11
56	110	2.8	7	11	13	10	7	0	48	56	1.16
57	110	2.4	3	24	19	4	0	0	50	76	1.53
58	110	1.0	16	18	8	0	0	0	42	92	2.20
59	110	2.3	5	13	29	0	0	0	47	70	1.49
60	110	3.0	0	9	22	12	0	3	46	40	0.87
61	110	2.0	7	18	10	0	0	0	35	67	1.91
62	110	3.1	0	9	19	5	8	0	41	37	0.81
63	109	2.2	0	13	10	7	0	0	30	36	1.20
64	109	3.3	2	0	10	0	4	0	16	16	1.00
65	109	3.0	0	10	1	8	5	9	33	21	0.63
66	108	3.3	3	4	16	10	0	0	33	33	1.00
67	108	3.0	0	15	32	3	0	0	50	62	1.24
68	107	3.0	0	15	8	10	3	0	36	38	1.06
69	107	3.0	0	23	10	10	0	0	43	56	1.30
70	107	2.7	0	10	35	0	0	0	45	55	1.22
Totals,	Third	Quarter	68	286	348	116	35	46	899	1124	1.20[c]
71	106	2.2	0	5	0	0	13	0	18	10	0.55
72	106	2.6	0	0	38	3	0	4	45	38	0.84
73	106	3.0	0	0	5	11	2	3	21	5	0.24
74	106	2.9	0	9	29	5	0	0	43	47	1.09
75	106	2.2	9	17	14	0	0	3	43	75	1.74
76	106	2.5	10	15	9	7	0	0	41	69	1.70
77	105	2.2	13	31	5	0	0	0	49	106	2.16
78	105	2.7	0	5	34	5	0	0	44	44	1.00
79	105	3.0	0	2	16	5	5	17	45	20	0.44
80	105	3.3	10	26	7	0	0	0	43	89	2.07
81	105	3.3	0	0	6	8	0	0	14	6	0.43

TABLE XXIV (*Continued*)

Rank According to I. Q.	I. Q.	I. Q. Scholarship	Number of Hours Indicated Grades at University						Total Hours	Honor Points	University Scholarship Rating[b]
			A	B	C	D	Cond.	Fail.			
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
82	104	2.6	0	10	5	8	0	7	30	25	0.83
83	104	3.0	0	18	13	9	0	4	44	49	1.11
84	103	3.0	3	24	19	0	0	0	46	76	1.65
85	102	4.0	0	6	17	5	0	3	31	29	0.93
86	100	1.0	0	12	26	5	0	0	43	50	1.16
87	100	4.0	0	3	19	14	1	5	42	25	0.59
88	100	1.0	7	25	4	0	0	0	36	75	2.09
89	96	2.8	0	13	30	0	0	3	46	56	1.22
90	95	3.6	0	3	18	9	0	0	30	24	0.80
91	92	2.9	6	10	16	8	5	0	45	54	1.20
92	90	4.0	0	10	16	15	0	5	46	36	0.78
93	82	2.7	0	3	0	0	0	10	13	6	0.46
Totals, Fourth Quarter			58	247	346	117	26	64	858	1014	1.18[c]
Grand Totals			563	1373	1225	355	104	139	3759	5665	

[a] 1.0 is the highest and 4.0 the lowest high-school scholarship rating.
[b] 3.0 is the highest and 0 the lowest university scholarship rating.
[c] Median scholarship rating for quartile.
[d] No. 47 is the median student according to intelligence quotients.

The corresponding figures for the fourth quarter contrast with those of the first quarter. For example, only 10 percent of the A's awarded to the 93 students were earned by the 23 students whose intelligence quotients were in the lowest quarter. On the other hand, 46 percent of all the failures occurred among these students. The general condition with respect to university marks is shown in Figure 5. Curve I is for the students whose I.Q.'s were in the first or highest quarter; curve II is for those whose I.Q.'s were in the second quarter; and so on. The significant fact to be observed is that curves I and II tend strongly to slope downward and to the right, while curves III and IV slope upward. Indeed, the pairs of curves form a rude X. This X is obscured by two perfectly explainable causes. The first is the tendency to "condition" capable students who have technically failed—generally because of some unusual circumstance. This tendency causes curves I and II to show an irregular rise at the

TABLE XXV. SUMMARY OF TABLE XXIV BY QUARTILES

Quartile	Median I. Q.	Median H. S. Scholarship	Percent of Total Number of Each Grade						Percent of Total Hours	Percent of Honor Points	Median University Scholarship
			A	B	C	D	Cond.	Fail.			
I	127	1.9	47	29	20	15	19	7	26	33	1.89
II	117	2.1	29	32	22	17	22	14	26	29	1.52
III	110	3.0	12	21	28	33	34	33	24	20	1.20
IV	104	2.8	10	17	28	33	25	46	22	17	1.00
I and II	122	2.0	76	61	42	32	41	21	52	62	1.75
III and IV	107	2.9	22	38	56	66	59	79	46	37	1.10
Median case[a]	113	2.7	2	1	2	2	0	0	2	1	1.40

[a]This is student No. 47 of Table XXIV. Entries on this line are the individual measures for that student.

point representing "conditions." The second cause which makes the curves irregular also has to do with the grade of "conditioned." Curve IV drops sharply at this point. Instructors having dull students whose work has not been clearly of passing qual-

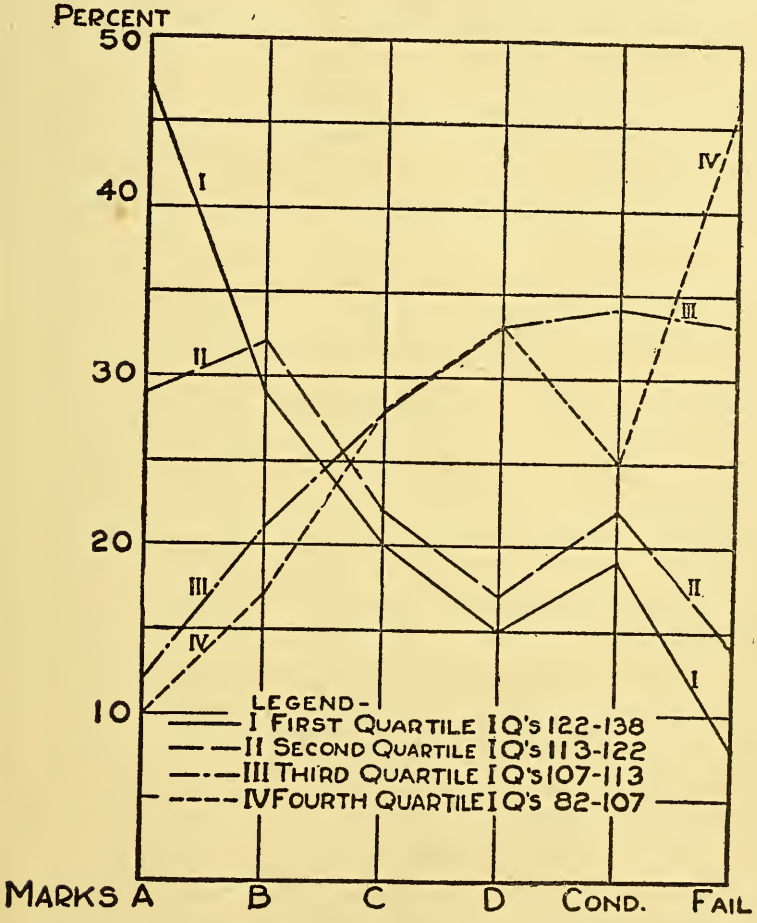

FIGURE 5. PERCENT OF EACH UNIVERSITY MARK RECEIVED BY QUARTILES I-IV. DATA FROM TABLE XV

ity tend to withhold the "condition" and to fail them without reprieve. With these rather easily explainable limitations, Figure 5 makes clear the fact that the high-school students who

received the better half of the intelligence ratings secured many high marks in the university and few low ones, and that the exact reverse was true with respect to the high-school students who receive the lower half of the intelligence ratings.

The reader's attention is also directed to the contrast between the figures given in Table XXV for the cases above the median (quarters I and II combined) and the figures for the cases below the median (quarters III and IV combined). From every viewpoint afforded by Table XXV and Figure 5 it appears that the Stanford students with I.Q.'s of 113 to 138 did work in the university that was distinctly superior to the work done by those whose I.Q.'s ranged from 113 down to 82.

The "Critical Score," or Intelligence Level Below Which Success in College is Problematical

The median I.Q. of the first-year high-school pupils has been shown to approximate 105, that of high-school graduates 111, and that of those going on to college 116.[8] Table XXIV shows the median I.Q. of the 93 university students therein tabulated to be 113. For the purposes of this discussion it will be convenient to divide the I.Q. range into five sections, as follows: I, over 125, superior; II, 110-124, above average; III, 95-109, average; IV, 80-94, below average; V, below 80, inferior or defective.

If the median I.Q. of college freshmen is found to lie between 110 and 116, we would expect a priori, to find that those who tested below 110 would furnish the larger proportion of failures. In Table XXIV there are 31 cases where the I.Q. falls below 110. These 31 cases (one-third of the total number) furnish 52 percent of the total number of hours of failure, and 63.1 percent of the total number having scholarship ratings below 1.00, or average. This showing would seem to indicate that in order to do average or better work in college it is necessary to have "better-than-average" intelligence, i.e., an I.Q. of 110 or above.

It should also be remembered that the data gathered in Table XXIV represent only the first three quarters of university

[8] Chapter II, p. 27. Also Chapter IV, p. 58.

work, corresponding to the freshman year. If the same process of selection takes place in college that we have shown to take place in high school, we should expect the median I.Q. of college graduates to be 120 or over. This would mean that many of those having just average intelligence, who are able to do the work of the freshman year with a fair degree of success would be likely to be eliminated before the senior year in college. That such would be the case seems to be a fair inference from the scholarship records of those whose I.Q.'s fell below 110 in Table XXIV. Those having just average intelligence would occupy the same relative place, so far as elimination from college is concerned, as those having below-average intelligence occupy in the high school.[9] The probability is strong that from 60 to 80 percent of them will be eliminated during the college course.

College Entrance by High-School Marks or Mental Tests?

From the data presented in Table XXII there appears to be a close relation between rank in mental tests and scholarship ratings in university work. A point that needs further discussion is whether mental tests would be as reliable a basis for the selection of college students as the record of four years in high school. Or, to state the problem differently, could the mental tests be safely substituted for the high-school scholarship record as a basis for admission to college?

Tables XXVI and XXVII show respectively the correlations between intelligence quotients and university scholarship ratings, and between high-school and university scholarship ratings. It should be remembered that the high-school marks represent ratings based on all marks received during four years of high school; that the university ratings are based on the first three quarters of university work; that the mental tests were given in 1916-17, while the students were still in high school; and that only one group mental test, the Army Alpha, was employed.

[9] See Tables VI (a) and VI (b), p. 25.

In Table XXVI there are ten cases where the I.Q. is above the group median, "110-114," and where the scholarship rating is below the group median, "1.25-1.49," but only two of the cases fall below "1.00," which stands for average scholarship.

Below the I.Q. group median there are six cases which show a scholarship rating above the scholarship rating median, but none of these has an I.Q. below 100.

TABLE XXVI. CORRELATIONS BETWEEN INTELLIGENCE QUOTIENTS OF 93 STANFORD UNIVERSITY STUDENTS AND THEIR UNIVERSITY SCHOLARSHIP RATINGS

I. Q.'s by Alpha 1916–17	University Scholarships Rating												Totals
	0.00 0.24	0.25 0.49	0.50 0.74	0.75 0.99	1.00 1.24	1.25 1.49	1.50 1.74	1.75 1.99	2.00 2.24	2.25 2.49	2.50 2.74	2.75 2.99	
135–139	....	....	....	....	....	....	....	2	....	1	....	....	3
130–134	....	....	....	1	1	....	1	....	....	....	2	....	5
125–129	....	....	....	1	1	....	4	1	1	2	1	....	11
120–124	....	....	....	....	2	2	....	1	1	2	2	1	11
115–119	....	....	....	....	4	3	2	3	1	2	....	....	15
110–114	1	1	....	3	3	3	2	1	3	....	....	....	17
105–109	1	2	2	1	8	1	2	....	2	....	....	....	19
100–104	....	....	1	2	2	....	1	....	1	....	....	....	7
95–99	....	....	....	1	1	....	....	....	....	....	....	....	2
90–94	....	....	....	1	1	....	....	....	....	....	....	....	2
85–90	....	....	....	....	....	....	....	....	....	....	....	....	0
80–84	....	1	....	....	....	....	....	....	....	....	....	....	1
Totals	2	4	3	10	23	9	12	8	9	7	5	1	93

Median I. Q. group, 110-114.
Median scholarship rating, 1.25-1.49.
Pearson coefficient of correlation, 0.495.
Probable error, 0.0526.

In Table XXVII there are nine cases of students above the median group in high-school scholarship and below the median group in university scholarship. Three are below "1.00" in university ratings. On the other hand, there are eight who fall below the median in high-school scholarship and who stand above the median in university scholarship. But the general agreement between high-school grades and university work is sufficient to give the relatively high correlation of 0.615.

In discussing an ideal examination of the intelligence of candidates for college entrance, Dr. E. L. Thorndike[10] says that the

[10] Thorndike, E. L. "Intelligence examinations for college entrants," *Journal of Educational Research*, 1:329, May, 1920.

score should correlate as closely as possible with future achievement in college, and further:

> This maximum correlation will not be 1.00, since achievement in college is due in part to health, to freedom from personal worries, and to various moral qualities as well as to intellect. . . . Within the restricted range of those who complete a high-school course and actually become candidates, we may expect as a maximum 0.55 to 0.65 possibly more. A correlation above 0.50 is probably an improvement over the attainment of standard systems of accrediting high schools or of entrance to college by examination in school subjects.

TABLE XXVII. CORRELATIONS BETWEEN THE HIGH-SCHOOL AND UNIVERSITY SCHOLARSHIP RATINGS

High School Scholarship	University Scholarship Ratings												Totals
	0.00 0.24	0.25 0.49	0.50 0.74	0.75 0.99	1.00 1.24	1.25 1.49	1.50 1.74	1.75 1.99	2.00 2.24	2.25 2.49	2.50 2.74	2.75 2.99	
1.00–1.24	....	....	....	....	1	....	....	1	3	....	2	....	7
1.25–1.49	....	....	....	....	....	....	....	....	....	1	3	1	5
1.50–1.74	....	....	....	....	2	....	....	2	1	1	....	....	6
1.75–1.99	....	....	....	1	1	....	1	2	1	2	....	....	8
2.00–2.24	....	1	1	....	2	3	3	2	1	2	....	....	15
2.25–2.49	....	....	....	....	2	1	3	1	1	....	....	....	8
2.50–2.74	....	....	....	3	4	....	2	....	....	1	....	....	10
2.75–2.99	....	1	....	....	5	3	1	....	1	....	....	....	11
3.00–3.24	2	2	1	3	4	2	2	....	....	....	....	....	16
3.25–3.49	....	....	....	....	2	....	....	....	1	....	....	....	3
3.50–3.74	....	....	....	1	....	....	....	....	....	....	....	....	1
3.75–4.00	....	....	1	2	....	....	....	....	....	....	....	....	3
Totals	2	4	3	10	23	9	12	8	9	7	5	1	93

Median university scholarship-rating group, 1.25-1.49.
Median high-school scholarship-rating group, 2.25-2.49.
Pearson coefficient of correlation, 0.615.
Probable error, 0.0445.

In Tables XXVI and XXVII the correlations between intelligence quotients and university scholarship, and between high-school scholarship and university scholarship were 0.495, P. E. 0.0526, and 0.615, P. E. 0.0445, respectively. That is, the correlation between high-school scholarship and university scholarship is higher by 12 points than the correlation between intelligence quotients and university achievement.

This difference in correlation in favor of the high-school scholarship might seem to indicate that the intelligence test is

not as reliable a criterion as the four-year high-school record of scholarship in determining fitness to do college work. Such a conclusion would not necessarily follow. Account must be taken of the fact that the intelligence test given in the case of the 93 students under consideration was given three years prior to the collection of data concerning their college work; that it was a group test, not specifically designed for college students; and that no supplementary tests were given which might have corrected or compensated for errors in rating chargeable to the admitted shortcomings of the Alpha Scale. Consequently Table XXIV and the correlation 0.495 represent the accuracy with which the person giving the Alpha Test to the pupils of the high schools near Stanford University in 1917-18 could have predicted their probable high-school and university careers. He would have been able to pick the 50 percent, who would almost surely succeed, and the 50 percent from among whose numbers the great majority of the failures and poor students would be found.

Furthermore, if supplementary group and individual mental tests had been given to these high-school pupils, much more reliable mental ratings would have resulted and the correlation between mental level and university work would have been considerably higher. In support of this contention two cases may be cited, i.e., those ranking 77 and 80 in Table XXIV. No. 80 had a high-school scholarship rating of 3.3, having earned an average of "C+" in all high-school subjects. Her intelligence quotient on Alpha was 105, which is 8 points below the median for the group. When she was in the eighth grade she was given a Stanford-Binet examination and earned an I.Q. of 120, which corresponds more closely than the Alpha I.Q. entered in Table XXIV with her university scholarship rating of 2.07. No. 77 had a high-school scholarship rating of 2.2, or about "B." His Alpha I.Q. was 105, but a Stanford-Binet examination taken a year earlier gave him an I.Q. of 115. His university scholarship rating was 2.16.

If the Stanford-Binet I.Q.'s of these two students alone had been used in Table XXIV instead of the Alpha I.Q.'s, the median I.Q. for the entire group would have been 115 instead of 113; and the percents of "A" grades, honor points, and high scholarship ratings coming in the upper, or above-the-median group, would have been considerably higher. Likewise, if these two cases had been entered in Table XXVI on the basis of the Binet I.Q., the correlation would have been approximately 5 points higher, or about 0.549.

It would probably be impracticable to attempt to substitute mental examinations entirely for records of attainment in high school as a basis for determining admission to college. But on account of the varying standards of marking that prevail in high schools it is impossible to accept an "A" mark given by one school as the equivalent of an "A" mark given by another school. Requiring all applicants for entrance to college to take mental tests would give to the registrar and committee on credentials an objective standard of judgment which would enable them to estimate with greater accuracy the abilities of those seeking admission to institutions of higher learning. Especially would this be true in institutions such as Stanford where the number who may attend is limited, and where the number of applicants greatly exceeds the possible number of entrants.

Summary and Conclusions

1. The ability to attain a high score on an intelligence test such as the Army Alpha is presumptive evidence of ability to do college work successfully. This is shown in Table XXIV by the proportion of "A" marks, honor points, and above-average scholarship ratings earned by the above-the-median group, and by the large proportion of "D's," conditions, failures, and below-average scholarship ratings earned by the below-the-median group.

2. It is possible to suggest a "critical score" or intelligence quotient below which success in college work, or ultimate gradu-

ation from college, would be open to question. Since the median I.Q. for college freshmen appears to lie between 110 and 116, and since the highest percent of failures, poor scholarship ratings, and other evidences of lack of ability to do college work successfully are found in the below-the-median group there is good reason to predict that a majority of the eliminations from college will come from those with I.Q.'s below the median for college freshmen.

3. While mental tests may not supplant "recommended" high-school units as a basis for college entrance, it is safe to say that such tests will soon be so well standardized as to become a generally accepted means of making final selection from among those seeking to enter college.

CHAPTER VIII

INTELLIGENCE TESTS AS A MEANS OF ADMITTING SPECIAL STUDENTS TO COLLEGES AND UNIVERSITIES[1]

Standard colleges and universities have come to be almost unanimous in requiring at least 15 units of high-school work as a prerequisite to admission to regular standing. This uniform requirement is made on the assumption that college work is so organized that only those with such a minimum of preparation can hope to carry on successfully.

Coincident with the fixing of uniform standards for college admission there has been a growing tendency to discourage the registration of special students. Some colleges even pride themselves in their catalog announcements that no special students are admitted. Such a policy, if uniformly adopted, would mean that a great many young persons of superior ability would be absolutely barred from the benefits of higher education and the state and nation would lose many capable leaders because training had been denied them.

Since the close of the world war a new condition has arisen which has challenged the wisdom of a too rigid adherence to set standards of college admission. During the war thousands of young men left high school to enter the army or to render industrial service. When the war was over they had been so matured by war experiences that they did not want to return to high-school associations, but did desire to continue their education. The colleges of the country rose to the emergency and opened their doors to the ex-service men, regardless in most cases of entrance deficiencies. An opportunity was thus afforded to test the validity of the four-year high-school assumption, particularly as it applies to men and women of maturity who have had worth while vocational or other significant life experiences.

[1] Reprinted from *School and Society*, Vol. 16, No. 408, October, 1922, pp. 471-476, with the permission of the *Science Press*.

The writer has had an excellent opportunity to make a study of the problem at first hand. As counselor for 170 ex-service men in training at Stanford University under the United States Veterans' Bureau, and at the same time a member of the faculty committee on admissions and advanced standing, he has been in a position to gather significant data regarding the ability of men without full high-school training, and in some instances without any high-school training whatever, to succeed in university work.

Stanford University definitely limits the number of men with less than junior standing who will be admitted in a given year. First choice is made from those who present 15 recommended high-school units, or passing grades in the Comprehensive or the College Entrance Examination Board examinations. Since the pressure to get into the university has been very great, in spite of greatly increased tuitions, very few places would ordinarily be left for men lacking full preparation. In anticipation of this difficulty President Wilbur asked the board of trustees to authorize the admission of all disabled ex-service men outside of the established limits. This was done and the task of making a selection among the men coming under this ruling for whom admission would be asked by the Veterans' Bureau was left to the committee on admissions and advanced standing. The following tentative minimum requirements were fixed: (1) age at least 21 years; (2) two years of high school; (3) a rating of at least "B" in a psychological examination.

The psychological examination used during the two years since the above regulation went into effect was the Army Alpha, supplemented by the Terman Group Test of Intelligence, forms A and B. A rating of B on the Army Alpha represents a score of 105 to 134. The rating of B on the Alpha Scale as one of the minimum requirements for special students was chosen because it was found by the Division of Psychology of the U. S. Army during the war that most of the failures in the officers' training camps were of men who rated below B, i.e., made scores below 105 on the Alpha Scale.

At the close of the fall quarter, 1921-22, there had been 41 cases admitted to Stanford in the way above described. Table XXVIII presents the data regarding school grade reached, hours

TABLE XXVIII. SCHOLARSHIP RATING OF 41 SPECIAL STUDENTS, TRAINEES OF THE U. S. VETERANS' BUREAU, AT STANFORD UNIVERSITY, ARRANGED IN RANK ORDER, LOWEST TO HIGHEST, ACCORDING TO SCORES ON ARMY ALPHA SCALE

Case No.	Scholarship Grade reached	Hours attempted	Grade points	Scholarship rating	Rank in Alpha	Average Scholarship rating
1	8th grade	9	0	0.0	C+	
2	2 yrs. H. S.	23	0	0.0	75–104	0.0
3	8th grade	9	0	0.0		
4	2 yrs. H. S.	10	0	0.0		
5	2 yrs. H. S.	64	62	0 97		
6	8th grade	14	14	1.00	B	
7	3 yrs. H. S.	40	32	0.80	105–119	0.50
8	3 yrs. H. S.	14	5	0.35		
9	3 yrs. H. S.	24	0	0.0		
10	2 yrs. H. S.	24	28	1.16		
11	2 yrs. H. S.	11	3	0.27		
12	3 yrs. H. S.	10	15	1.50	B+	
13	3 yrs. H. S.	60	78	1.13	120–134	1.07
14	3 yrs. H. S.	28	38	1.35		
15	3 yrs. H. S.	54	56	1.03		
16	3 yrs. H. S.	12	14	1.12		
17	3 yrs. H. S.	56	62	1.10		
18	3 yrs. H. S.	33	17	0.51		
19	3 yrs. H. S.	9	14	1.56		
20	2 yrs. H. S.	9	14	1.56		
21	3 yrs. H. S.	40	63	1.57	A	
22	2 yrs. H. S.	10	10	1.00	135–154	1.35
23	2 yrs. H. S.	10	21	2.10		
24	3 yrs. H. S.	12	17	1.42		
25	3 yrs. H. S.	31	45	1.45		
26	3 yrs. H. S.	52	89	1.90		
27	2 yrs. H. S.	14	18	1.28		
28	3 yrs. H. S.	23	28	1.21		
29	5th grade	29	60	2.07		
30	8th grade	8	17	2.13		
31	3 yrs. H. S.	41	71	1.74		
32	2 yrs. H. S.	10	10	1.00		
33	3 yrs. H. S.	69	155	2.22		
34	1 yr. H. S.	16	40	2.50	A+	
35	3 yrs. H. S.	33	63	1.90	155–212	1.93
36	3 yrs. H. S.	36	67	1.86		
37	3 yrs. H. S.	23	39	1.70		
38	3 yrs. H. S.	17	34	2.00		
39	2 yrs. H. S.	63	111	1.76		
40	3 yrs. H. S.	58	104	1.80		
41	1 yr. H. S.	39	83	2.13		

NOTE: See note 7, p. 92, Chapter VII.

of university work attempted, grade points earned, scholarship rating, rank attained on Army Alpha, and average scholarship ratings of each group. The top line of the table should be read as follows: Case No. 1 had attained eighth-grade standing in the public schools, undertook nine hours of university work, earned zero grade points, a scholarship rating of zero, and ranked lowest in the C + (score 75 to 104) group on the Army Alpha Scale.

Attention is directed to the first three cases in the table, which come in rank C+ in intelligence rating. No special student was supposed to be admitted whose intelligence rating fell below 105, the lower limit of the B rating, but the writer persuaded the committee on admissions to give these three men a trial as "may-attend" students. Such students have all the privileges of regular students so far as attending lectures, taking examinations, etc., is concerned, but their final status depends either upon completion of credentials or demonstration of ability to carry the work undertaken with success. Ordinarily the status is never continued beyond the mid-quarter examinations, but in the cases of these three Veterans' Bureau men the "may-attend" status was continued for an entire quarter as an experiment. None of the three, however, succeeded in securing regular standing, although No. 2 was given a second chance and attempted 23 hours in all.

Beginning with case No. 4, all of the remaining men were admitted to the university as special students and remained at least one quarter in residence. The cases are grouped by steps of 20 points on the Alpha Scale and designated: B (105-119), B + (120-134), A (135-154), and A + (155-212). There is a progressive rise in scholarship rating, corresponding to the ascending ranks in intelligence from zero for the C + group to 1.93 for the A + group.

The "critical score" of the distribution seems to be 120, the lower limit of the B + group. Only two of the cases, Nos. 5 and 6, are now in the university, who made scores below that figure. One of the two will never be able to pull through to

graduation, and the other has had a very precarious footing and may slip and fall out at any time since he has no margin for safety.

The B + group makes a bare C average in scholarship, i. e., one grade point for each hour of work attempted, as represented by their average scholarship rating of 1.07. It is not until we come to the A group, making Alpha scores of from 135 to 154, that we find an average scholarship rating equal to the average for men in the university. This group averaged 1.35 in scholarship. Only one man in the A group failed in his work, No. 18, who had been seriously injured in an airplane smash in France and had not recovered his nervous balance sufficiently to concentrate on his studies.

The A + group attained an average scholarship rating of 1.93, which is 20 points above the average for Stanford's highly selected group of 500 women students, and 64 points above the general average for all men students in the university. There were no failures at all in this group, although one had had only fifth-grade education, another only eighth-grade education, two had had only one year of high school and two others only two years of high school before being admitted to Stanford as special students under the conditions described above.

A brief statement of what some of these men are accomplishing will give an idea of the way in which they are taking advantage of the opportunities afforded by the Stanford policy of admitting men to the privileges of university training who lack full entrance credentials.

Case No. 29.—This man had had only fifth-grade education, but had worked his way up in railroad service to being an office manager. He made a score of 155 on Alpha, was admitted as a special, and took 14 hours of work. He acted as clerical assistant in the writer's office for two hours a day, took part in two dramatic productions during his first quarter, and made a B average in all his work or a scholarship rating of 2.00. The second quarter he took 15 hours of work, continued his office service, was leading man in two dramatic productions, was elected to

presidency of the leading dramatic organization on the campus, and made a scholarship rating of 2.13,—an average for the two quarters of 2.07.

Case No. 34.—This was a man of Polish birth, who while working as a logger had completed his elementary studies. The Veterans' Bureau gave him one year of secondary education and sent him to Stanford to prepare for civil engineering. He made a score of 168 on the Alpha test. He took 16 hours of work during his first quarter, including two heavy mathematics courses, and made 40 grade points, with a scholarship rating of 2.50.

Case No. 41.—This man had had just one year of high school, but was admitted on a score of 183 on the Alpha Scale, and permitted to register as a special student in entomology. His first quarter's record won for him the distinction of being the Stanford student representative with the California Academy of Science expedition to South America. He has since published two papers in leading scientific journals embodying the results of his research while with the Academy of Science expedition.

The cases above cited suggest that Stanford will one day take great pride in the fact that these men were enabled to secure their training within her walls in spite of deficiencies in secondary preparation.

Assuming, for the sake of argument, that a case has been made out for admitting men as special students on the ground of worth while experiences of life and proof of adequate mental capacity, shall such students be permitted to graduate, and if so under what conditions?

Two western institutions, the Universities of Arizona and Nevada, have by faculty action expressed a willingness to graduate disabled veterans of the world war in regular course, i. e., without requiring them to make up entrance deficiencies, provided they are able to maintain institutional requirements as to standards of scholarship and meet all other requirements for graduation. Both institutions require satisfactory psychological examination results as a prerequisite to admission. Reports from both institutions indicate that the plan is working satisfactorily.

Stanford has adopted a plan which does not discriminate between disabled veterans and other students. Any special student, admitted by the committee on admissions and advanced standing, can graduate by making the required scholarship rating in not less than 225 quarter hours of work. The requirement for students with full entrance is 180 units for graduation. This means that a special student is permitted to graduate in one extra year. Since the institution is on the quarter basis and three quarters constitute an academic year, a special student by attending four quarters each calendar year can secure his degree in 15 quarters, or three and three-fourths calendar years.

The advantage of giving the special student the opportunity of graduating by working an extra year in the university itself rather than requiring him to complete secondary preparation before entering should be obvious. These special students are assumed to be persons over 21 years of age. They would feel out of place in a high school and most of them would be unable to adapt themselves to conditions found in the average high school, but if admitted to the university they feel more at home, and will put forth every ounce of energy to make good. This is shown by Table XXIX, where 13 regular students who made A + scores on the Alpha test are compared with the 13 special students who made scores of A + on the Alpha Scale. The 13 regular students whose scholarship ratings are shown in this table are also trainees of the Veterans' Bureau, having their tuition, book expenses and a maintenance allowance for living expenses, paid by the U. S. government. This group of 13 had all completed four years of high school at the time of entering training at Stanford, and constitute the 13 having the highest scores in the intelligence test, of all the Veterans' Bureau trainees having regular standing. Each group in the table is arranged in rank order beginning at the lowest. The range of scores for the regular group is from 170 to 186, and for the special group from 155 to 183, on the Alpha Scale.

It is unsafe, of course, to give undue weight to data covering so few cases, but it is at least rather significant that the 13 spe-

cial students making the highest scores in intelligence examinations should have made a scholarship rating of 1.93, while the 13 regular students making the highest scores on the same scale made a scholarship rating of 1.78, or 15 points lower; also that the average for all specials (1.45) is 7 points higher than the average for all the regular trainees of the U. S. Veterans' Bureau.

TABLE XXIX. COMPARING 13 A+ SPECIAL VETERANS' BUREAU TRAINEES WITH THE 13 REGULAR V. B. TRAINEES WHO MADE THE HIGHEST SCORES IN THE ALPHA TEST, AS TO SCHOLARSHIP RATINGS IN UNIVERSITY WORK

13 Alpha A+ Specials				13 A+ Regulars (Highest)			
Case No.	Hours attempted	Honor points	Scholarship rating	Case No.	Hours attempted	Honor points	Scholarship rating
1	29	60	2.07	1	158	228	1.44
2	8	17	2.13	2	105	112	1.06
3	41	71	1.74	3	142	254	1.79
4	10	10	1.00	4	156	233	1.56
5	69	155	2.22	5	95	124	1.30
6	16	40	2.50	6	64	73	1.14
7	33	63	1.90	7	91	188	2.06
8	36	67	1.86	8	106	318	3.00
9	23	39	1.70	9	93	172	1.85
10	17	34	2.00	10	79	208	2.63
11	63	111	1.76	11	82	179	2.19
12	58	104	1.80	12	40	22	0.55
13	39	83	2.13	13	81	193	2.38
Totals	442	854	Ave. 1.93		1,292	2,304	Ave. 1.78
Range of Alpha scores of special group from 155 to 183. Median, 166. Average scholarship rating of all specials, not counting the 3 C+ cases, who were "may-attends," is 1.45.				Range of Alpha scores of regular group from 170 to 186. Median, 174. Average scholarship rating of all regular Veterans' Bureau trainees, covering six quarters, is 1.38.			

The presumption is at least strong that given superior intelligence, maturity and a well defined life purpose a man can successfully carry university work, even though he may lack the customary four years of preparatory work.

There are educators who seem to be concerned lest mental tests become the excuse for a new doctrine of infant damnation.[1] They hold that it is unsafe to admit, even if probably true, that

[1] Bagley, F. C. "Educational Determinism; or Democracy and the I.Q." *School and Society*, 15:373-84, April 8, 1922.

some of us are intellectually pint cups and others gallon measures. It is just possible that their alarm is premature. It is a poor rule that will not work both ways. Perhaps too much emphasis has been put upon the revelations that tests have been made of mental deficiencies, often on the basis of a single group test. Sweeping generalizations, based on unreliable or insufficient data, to the effect that 47 percent of the white men taken in the draft were of moron grade of intelligence,[2] tend to discredit the whole testing program. But such errors are merely the by-products of a great forward movement in education. Mental tests are here to stay, and on all sides are indications that the positive uses to which such tests may be put are being stressed.

One of the most hopeful signs pointing toward the positive, as opposed to the negative use of mental tests, is the attitude of colleges and universities in the matter of admitting special students who have made high scores in intelligence tests, after the manner above described. Too many mental diamonds, which might otherwise be discovered and polished, now remain in the rough on account of the formal, inelastic entrance requirements of our colleges and universities. Psychological tests will serve the cause of democracy if they help to open the doors of our higher institutions to men and women of marked ability who would otherwise be barred on account of entrance deficiencies.

Summary and Conclusions

1. The practically universal requirement of four years of high school for college entrance, coupled with pressure for admission, tends more and more to exclude from higher educational opportunities, men and women who, although capable and mature, lack entrance requirements. The species *special student* is in danger of becoming extinct.

2. The world war caused many institutions to open their doors to special students who had been disabled in military

[2] Cannon, Cornelia James. "Democracy in Question: I. American Misgivings." *Atlantic Monthly*, February, 1922, pp. 145 ff.

service, on the basis of mental ability, maturity, and vocational experience.

3. Records of 41 such special Veterans' Bureau trainees at Stanford indicate that their success in university work has been in direct ratio of their scores on the Army Alpha intelligence scale. Also that the highest 13 mentally of the specials made an average scholarship rating 15 points higher than the highest 13 of the regular Veterans' Bureau trainees. All specials averaged higher in scholarship than all regulars.

4. In the light of such results it should become the practice of colleges and universities to reserve a definite proportion of registrations for men and women of maturity, proved mentality, and definite employment objective, regardless of entrance deficiencies. The case of the man, No. 29, in Table XXVIII, who was admitted with fifth-grade education and made better than a "B" average in two quarters of work will become classic as an illustration of what special students of this type are capable of doing.

5. Not only should special students be admitted on passing satisfactory mental examinations, but they should be allowed to graduate on a minimum of one extra year of university work, without being compelled to make up traditional entrance requirements.

APPENDIX

I. The Kohs-Proctor Mental Age Norms for the Army Alpha Scale

During the year 1917-18 the Army Alpha Scale was given to several thousand California school children. The children tested were drawn from all types of communities and represented every variety of social status. The high-school pupils, whose scores, school marks, etc., have been discussed in the preceding chapters were among this number.

In dealing with adults, an absolute point scale with the total scores grouped into five or seven sections will give reasonably accurate impressions as to mental level. But in the case of children, most of whom are below sixteen years of age, it is desirable to use the intelligence quotients, or ratio between mental age and chronological age. In order to assign I.Q.'s to the public school pupils who had been examined with the Army Alpha it was necessary to discover mental age norms corresponding to given scores earned on the Alpha Scale.

The writer collaborated with Dr. Samuel Kohs in working out norms that could be employed tentatively in computing correlations between school work, teachers' estimates of ability, and intelligence quotients.

The first step was to find the curve of distribution of scores in the Alpha Test by chronological age groups. The groups covered six months of chronological age, i.e., from 9 years, no months to 9 years, 5 months in one group, and from 9 years, 6 months to 9 years, 11 months in another group, etc. A curve for the median scores made by these chronological age groups was plotted.

It was found that about seven hundred of the children who had taken the Alpha Scale had at one time or another been given the Stanford-Binet individual test. The Alpha scores made by these children were distributed by mental age groups and a curve plotted of the median scores by six-months mental age groups.

The two curves were found to correspond quite closely. There was a variation of from twelve to twenty points on the absolute scale to cover a mental age or chronological age year. For the years where there were at least 100 cases in each six-months chronological age group the number of points on the scale necessary to cover a mental age year varied only from 13 to 17.

It was found that by allowing 15 points on the Alpha Scale for each mental age year, and starting with "0" score on Alpha as equivalent to a mental age of 9 years 0 months, a correlation of over 0.90 between Stanford-Binet I.Q.'s and Alpha I.Q.'s was obtained.

Table XXX gives the corresponding mental age norms according to the Kohs-Proctor results and the results obtained by the Division of Psychology, Surgeon General's Office of the Army. Figure 6 is a graphic representation of the two sets of norms.

The Army psychology norms were worked out on the basis of Stanford-Binet and performance tests given to army recruits who had also taken the Alpha Scale. Because the highest mental age attainable on the Stanford-Binet is 19 years, 6 months, the curve for these norms begins to be more and more depressed as mental age 19–6 is approximated. Up to age 18–0 the Army psychology mental ages approximate one year higher for a given score on Alpha than the Kohs-Proctor mental ages. The curves cross at age 18–0 and thereafter the Kohs-Proctor norms show a higher mental age for a given Alpha score than do the Army psychology norms.

In Figure 7 the Kohs-Proctor norms conform to a straight line, because when it was found that 15 points on the Alpha Scale corresponded most nearly to a mental age year (the "cut and try" method of arriving at this approximation being employed) the "zero" point, or point below which the median score of the children was "zero" was taken as the starting point. This was found to be 9 years, 0 months. From this point ascending twelve points on the perpendicular for every fifteen points on the horizontal axis, the line was drawn.

These norms have been applied to the Alpha scores of over 2,000 high-school pupils and to many grade children. About 40 percent of these pupils have been given the Stanford-Binet;

TABLE XXX. MENTAL-AGE EQUIVALENTS OF ALPHA SCORES, ACCORDING TO KOHS-PROCTOR AND ARMY PSYCHOLOGY NORMS

Army Ratings	Alpha Scores	Mental Ages According to	
		Kohs-Proctor Norms	Army Psychology Norms
D−	0	9—0	9—0
	5	9—4	9—6
	10	9—8	10—0
D	15	10—0	10—6
	20	10—4	11—0
C−	25	10—8	11—6
	30	11—0	12—0
	35	11—4	12—3
	40	11—8	12—6
C	45	12—0	13—0
	50	12—4	13—3
	55	12—8	13—6
	60	13—0	14—0
	65	13—4	14—3
	70	13—8	14—6
C+	75	14—0	15—0
	80	14—4	15—3
	85	14—8	15—6
	90	15—0	16—0
	95	15—4	16—3
	100	15—8	16—6
B	105	16—0	16—9
	110	16—4	17—0
	115	16—8	17—2
	120	17—0	17—4
	125	17—4	17—6
	130	17—8	17—9
A	135	18—0	18—0
	140	18—4	18—3
	145	18—8	18—6
	150	19—0	18—8
	155	19—4	18—10
	160	19—8	19—0
	165	20—0	19—2
	170	20—4	19—4
	175	20—8	19—6
	180	21—0	19—8
	185	21—4	20—0
	190	21—8	20—4
	195	22—0	20—6
	200	22—4	20—8
	205	22—8	20—10
	210	23—0	21—0

and the correlations obtained between Binet I.Q.'s and Alpha I.Q.'s range from 0.80 to 0.92.

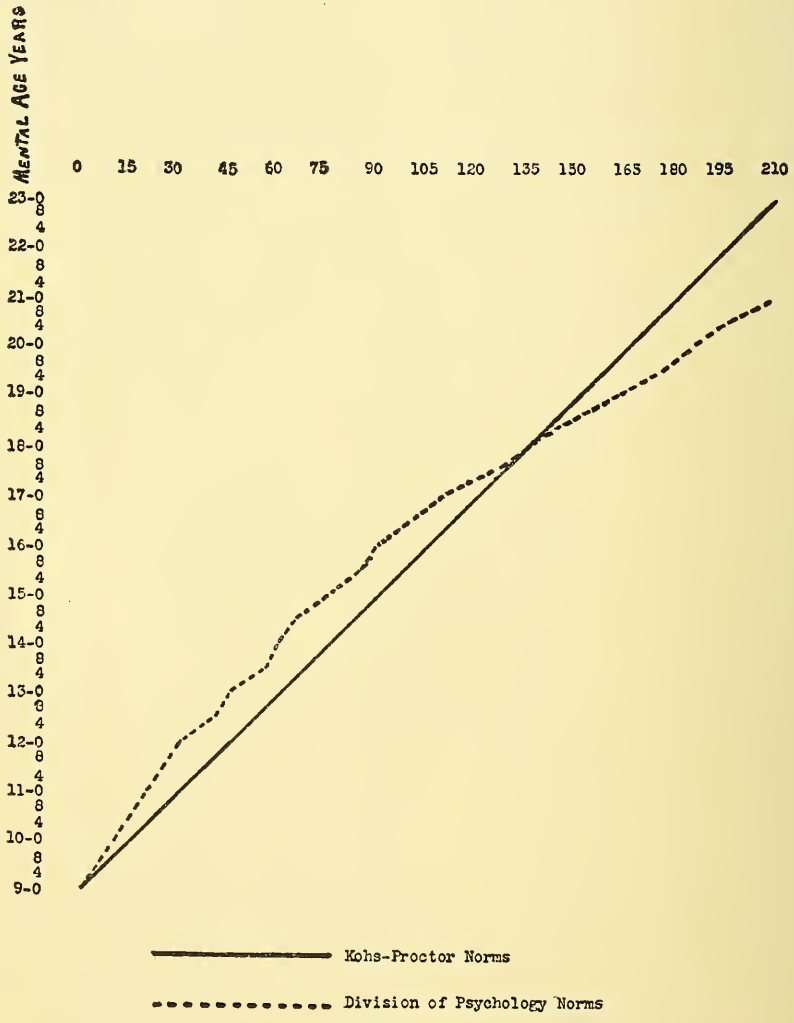

FIGURE 7. SHOWING KOHS-PROCTOR AND DIVISION OF PSYCHOLOGY, SURGEON GENERAL'S OFFICE, U. S. A., MENTAL AGE NORMS FOR ALPHA SCALE

II. Mental Tests Available for the Examination of High-School Pupils

1. *The Stanford-Binet.*—This is the Stanford Revision of the Binet-Simon Scale. It makes possible measurement of mentality up to 19 years, 6 months, and on that account is better adapted to the testing of high-school pupils than any other revision of the Binet Scale that has been published. Record booklets, test-materials, score cards, etc., as well as Dr. Terman's book, *The Measurement of Intelligence,* which should be mastered by anyone who undertakes to give the Stanford-Revision, can be secured from Houghton Mifflin Co., Boston.

2. *The Alpha Group Test, Army Scale.*—This was the group test developed by the Division of Psychology, Surgeon General's Office, U. S. Army and employed in the examination of nearly two million men. It consists of eight separate tests and has a total possible score of 212 points. It can be given to several hundred persons at once, requires about 45 minutes, and can be scored mechanically by trained clerical workers. Examiners' guides, test booklets, etc., can be had in quantity from the Bureau of Standards and Measurements, State Normal School, Emporia, Kansas.

3. *The Terman Group Test of Mental Ability.*—This test has been developed and standardized by Dr. Lewis M. Terman, Professor of Educational Psychology, Stanford University, joint author of the National Intelligence Tests and of the Army Tests; also author of the Stanford-Revision of the Binet-Simon Scale and books on the measurement of intelligence. This is the only test yet published which is especially adapted for pupils of high-school grade. It may also be used successfully in grades six, seven, and eight, and in the first year in college. The test is issued in two separate forms, Form A and Form B, each of which contains 185 problems or questions. Manual of Directions gives full information for giving and scoring the test. Sold in packages of 25, including Manual of Directions and Scoring Key, by the World Book Company, Yonkers-on-Hudson, New York.

4. *The Otis Advanced Group Intelligence Scale.*—The Otis

tests were among the first comprehensive group tests to be published before the Army Alpha Tests were released for general use. Mr. Otis had done more than almost any other psychologist in the development of group tests at the time of the organization of the Division of Psychology, U. S. Army. Many of the tests which he had already perfected were adopted as part of the Army group examinations a and b and Alpha. The Otis tests consist of ten well-selected tests arranged in booklet form, and published, with Manual of Directions, instructions for scoring, etc., by the World Book Company, Yonkers-on-Hudson, New York. These tests are also put up in packages of 25.

5. *Thorndike's College Entrance Test.*—The original tests of the series of college entrance tests now being developed by Dr. Thorndike consisted of two forms, Form A and Form A1. Form A was made up of a series of 13 tests, the first ten of which were very similar to the 10 tests of the first Army Scale, Examinations *a* and *b*, with a "True-False," a "Memory" for geometrical forms, designs and numbers, and a "Logical Reasoning" test in addition. Form A1 consists of nine tests, all involving a knowledge of literature, history, science, mathematics, etc., that every high-school graduate is presumed to have. It is Dr. Thorndike's purpose to develop new tests or series of tests often enough to prevent coaching on the specific items. High correlations between the intelligence scores earned on the Thorndike College Entrance Tests and subsequent work in colleges and universities have already been found. These tests are published by the Bureau of Publications, Teachers College, Columbia University, New York, N. Y.

III. The Barr Scale for the Measurement of Vocational Status

A scale for the measurement of vocational status was recently worked out by Mr. F. E. Barr, assisted by Miss M. B. Henry and Mr. E. Buckles, all at that time, 1917-18, advanced graduate students at Stanford University. The method followed in working out the scale was to write on separate cards descrip-

tions of 122 different occupations, covering the most common vocations to be found in all lines of endeavor. Thirty different judges were asked to arrange the cards on which these occupations were described in the order of the degree of intelligence necessary to succeed in them. For purposes of scale making occupation "hobo" was to be ranked "0," while occupation "inventive genius" (Edison type) was to be ranked "100." Certain occupations were also suggested as having the probable value of "75," "50" and "25." The judges were asked to take these key suggestions and arrange the whole list in rank order. After the judges had ranked the occupations, the scale was worked out by the use of Dr. Samuel Kohs' modification of Thorndike's "Probable Error" method of scale making. The scale is thus expressed in Probable Error values, which enables one to compare directly the amount of mental ability required for success in one occupation (in the estimate of the judges consulted) with that required in another occupation. For example: Occupation "hobo" stands at the "0" point of the scale, while "day laborer" stands at point 3.62 P. E. That is to say, the day laborer stands 3.62 P. E. values higher on the occupational scale than the hobo. "Inventive genius" (Edison type) stands at top of scale and represents P. E. value 20.71.

In order to divide the scale into ranks for purposes of comparing say the occupation of the father with the occupational ambition of the boy or girl, we divide the highest P. E. value i.e., 20.71 by the number of ranks we want to deal with, say 5, which gives us 4.14. Starting then with "V" as the lowest rank, all occupations falling within 4.14 P. E. values from "0" would rank as "V". All those falling between P. E. 4.15 and 8.28 would rank as "IV"; between P. E. 8.29 and 12.42, as "III"; between P. E. 12.43 and 16.56, as "II"; between P. E. 16.57 and 20.71, as "I".

To show how this scale classifies occupations according to the ability necessary to succeed in them, a few occupations falling in each rank in a series of five ranks, with their assigned P. E. values will be given:

Rank I	Inventive genius (Edison type)	P. E.	20.71
P. E. Val.	Surgeon (like Mayo Brothers)	"	19.73
16.57 to	Research leader (like Binet or Pasteur)	"	19.45
20.71.	High national officials	"	18.33
	Musical or literary genius	"	18.14
	Great merchant or magnate	"	18.06
	University administrator	"	17.81
	Publisher (high class magazine)	"	17.50
	Physician	"	16.71
	College professor, city supt	"	16.64
Rank II	Mining engineer	"	16.26
P. E. Val.	Lawyer	"	15.75
12.43 to	Industrial chemist	"	15.42
16.56.	Minister or priest	"	15.15
	Owner of large farm	"	14.45
	Train dispatcher	"	13.31
	Small manufacturer	"	13.31
	Master mechanic	"	13.29
	Druggist	"	13.21
	Osteopath	"	13.20
	Grade teacher	"	13.08
Rank III	Librarian	"	12.22
P. E. Val.	Trained nurse	"	12.06
8.29 to	Stenographer	"	11.78
12.42.	Grocer, small merchant, etc.	"	11.51
	R. R. passenger conductor	"	11.35
	Photographer	"	10.83
	Wood and metal pattern makers	"	10.54
	Undertaker	"	10.21
	Salesman (clerk in store)	"	9.72
	Carpenter, skilled mechanic	"	9.37
	Electric repairman	"	8.99
	Plumber, journeyman	"	8.75
Rank IV	Harness maker	"	8.22
P. E. Val.	Plasterer	"	8.02
4.15 to	Policeman	"	7.54
8.28.	Brakeman	"	7.30
	Vulcanizer	"	7.02
	Switchman	"	6.42
	Deliveryman and drayman	"	5.87
	Dairy-hand	"	5.59
	Bar-tender	"	5.27
	Farm-hand	"	4.91
	Miner	"	4.29
Rank V	R. R. section-hand	"	3.60
P. E. Val.	Day laborer	"	3.57
0.0 to 4.14.	Garbage collector	"	2.11
	Odd jobs, transient worker	"	1.54
	Hobo	"	0.00

The above described scale for the measurement of occupational status is of course only tentative and leaves much to be desired in the way of scientific classification and evaluation of

qualities essential to success in a given occupation. All that is claimed for it is that better results will be obtained through its use in the ranking of occupational status than would be possible if only the unsupported judgment of any single individual was to be consulted.

An opportunity to compare the Barr Scale with the results of the Army Mental Tests is afforded by the publication of a pamphlet by the Surgeon General's office giving the mental scores by occupations of 36,000 men.[1] From the tables in this pamphlet it appears that the median score of day laborers is "C—" or 5 on a scale of 7; and that 37½ percent of them rank in class 6 where the Barr Scale places them. Dr. Giles M. Ruch worked out the correlation (rank order) between the median scores made by the different occupations in the Army tests and the rank order assigned to the same occupations in the Barr Scale and found the correlation to be "r equals 0.79 with a P. E. of 0.058." This result would indicate that the Barr Scale is sufficiently reliable to be utilized for the purpose of comparing the occupations of fathers with the vocational ambitions of their children.

Final Word

The writer has endeavored to set forth as faithfully as possible the results of the use of mental tests in the discovery of the mental levels of high-school pupils. Three different groups have been followed: the first, a group of pupils entering the Palo Alto High School as first-year students, and given the individual tests, and most of them later the military group tests; the second, a group of pupils representing five high schools and all of the pupils present in each high school on the day when the test, the military group tests, were given; the third, a group of U. S. Veterans' Bureau trainees, admitted to Stanford University as special students on the basis of scores on group tests, regardless of high-school preparation. The sixth- and seventh-year follow-up of the first group is treated in Chapter IV; the

[1] Army Mental Tests. Methods, Typical Results and Practical Applications. Washington, D. C., November 22, 1918, p. 23.

second group (fourth-year follow-up) is treated in Chapter VI, and the third group in Chapter VII.

The long-time follow-ups on the first and second groups show remarkable agreement regarding the general mental level of those who drop out before graduation from high school, those who graduate from high school and those who continue their education in higher institutions. They agree also in supporting the contention that social status and the cherishing of educational and vocational plans of a definite nature are significant factors in school achievement and survival. The results of the study of the third group indicate that intelligence, plus a definite employment objective, enables a mature student to overcome the handicap of a lack of high-school training, and to carry university work successfully and even with distinction.

Since these studies were begun, seven years ago, the use of mental tests in the educational and vocational guidance of pupils in all departments of the school system has become one of the most discussed topics in educational literature. There is every indication that the movement will continue to grow. It is perhaps inevitable that a movement which has spread so rapidly should be in greatest danger of serious harm from its over-zealous but under-cautious advocates—from those who draw untenable conclusions from inadequate data, and proceed to advertise their new-found wisdom to a sensation-hungry world. No one should be permitted to apply mental tests to public school pupils, who has not first familiarized himself with the tests to be given, with the procedure as outlined and standardized by the author or authors of the tests, and above all with the methods of scoring and interpreting the results. Results obtained should be considered as tentative,—not in any sense absolute, and should be kept strictly confidential. In other words, "the coefficient of common sense" of the tester should be ascertained to be very high before he is permitted to handle tests or predicate advice on the results obtained. When at all possible, two different tests, or two batteries of the same test scale, should be used.

Assuming that the cautions suggested above will be observed, and that only thoroughly standardized tests will be employed, it may finally be said that: Applied by trained examiners, scored by expert assistants, tested against all available criteria for validity, individual and group mental tests are proving of invaluable assistance to secondary-school teachers in the task of giving educational and vocational advice to high-school pupils.

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